J. E. Allison M.D.

THE

MICROSCOPIC ANATOMY

OF

THE HUMAN BODY,

IN

HEALTH AND DISEASE.

ILLUSTRATED WITH NUMEROUS DRAWINGS IN COLOUR.

BY

ARTHUR HILL HASSALL, M. B.

Author of a "History of the British Fresh-water Algæ;" Fellow of the Linnæan Society; Member of the Royal College of Surgeons of England; one of the Council of the London Botanical Society; Corresponding Member of the Dublin Natural History Society, &c.

WITH

ADDITIONS TO THE TEXT AND PLATES,

AND

AN INTRODUCTION,

CONTAINING INSTRUCTIONS IN MICROSCOPIC MANIPULATION.

BY

HENRY VANARSDALE, M. D.

IN TWO VOLUMES

VOL. II.

NEW YORK:

SAMUEL S. & WILLIAM WOOD,

261 PEARL STREET.

1855.

FOUNDRY OF
SILAS ANDRUS AND SON,
HARTFORD.

PRESS OF
F. C. GUTIERREZ,
NEW-YORK.

INDEX OF THE ILLUSTRATIONS.

THE WHOLE OF THE FOLLOWING ILLUSTRATIONS ARE ORIGINAL WITH BUT NINE EXCEPTIONS:

BLOOD.

DEVELOPMENT OF EMBRYO OF CHICK.

MUCUS.

PUS.

MILK.

NAILS.

PIGMENT CELLS.

HAIR.

CARTILAGE.

BONE.

TEETH.

FIBROUS TISSUE.

MUSCLE.

NERVES.

ANATOMY OF THE SENSE OF TOUCH.

ANATOMY OF THE SENSE OF TASTE.

ANATOMY OF THE GLOBE OF THE EYE.

ANATOMY OF THE NOSE.

ANATOMY OF THE EAR.

VILLI.

Plates VIII., XVII., and XXXVIII., omitted in the original edition, are likewise here omitted. The same numbers for the other plates are observed, that the figures in both editions may correspond.

The Plates added to the American Edition commence at Plate LXX.

PLATES ADDED

TO

THE AMERICAN EDITION.

EXPLANATION OF THE PLATES

PLATE I.

The figures in this plate are magnified 670 diameters.

THE BLOOD OF MAN.

Fig. 1. The human red blood corpuscle, showing its natural form and appearance when brought fully into focus, in which case the centre always appears light. Scattered over the field will be seen one or two white corpuscles.

2. The same, with the centre dark, in consequence of the object not being brought fully into focus.

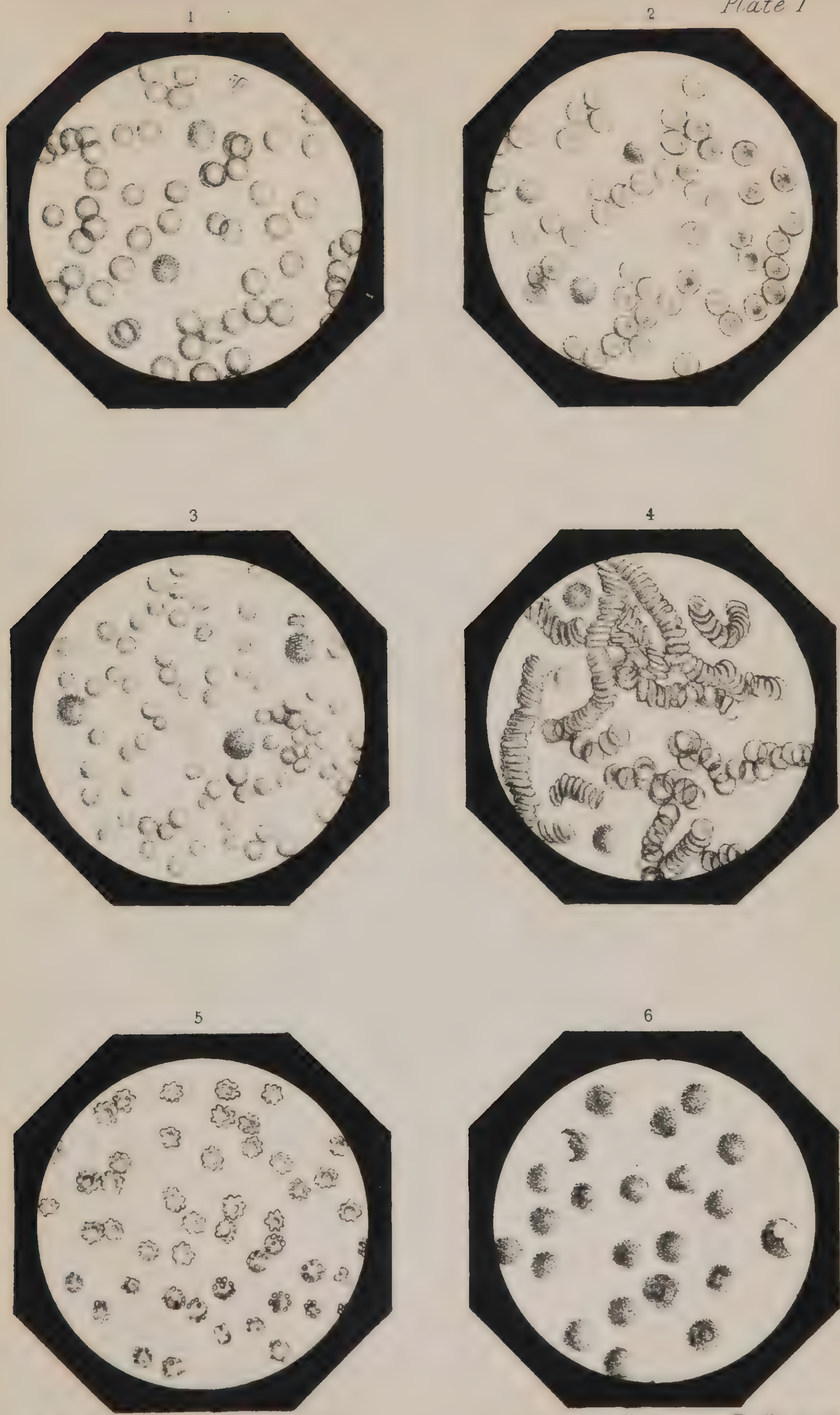
3. The same in water, in which the red globules lose their flattened and discoidal form, becoming circular, and presenting a smaller surface to view; the white corpuscles at the same time, and under the influence of the same agent, are seen to have increased considerably in size.

4. The same, united into rolls, as of miniature money in appearance.

5. The same, showing the peculiar granulated and vesiculated appearance which they so frequently present under such different circumstances.

6. The white corpuscles of the blood, in water, in which they enlarge considerably in dimensions, often appear nucleated, and after long immersion, burst.

Plate I



H Maller del

E C Kellogg lith

PLATE II.

The figures in this plate are magnified 670 diameters.

THE BLOOD OF THE FROG.

Fig. 1. The blood corpuscle of the frog, both red and white, with the nucleus of the former seen indistinctly.

2. The same, with the nucleus distinctly visible, the difference arising from the greater length of time during which the latter has been removed from the system.

3. The same, in water, showing the change of form which the red blood corpuscle, as well as its contained nucleus, undergoes in that fluid, and also the enlargement of the white corpuscles.

4. The same, showing the effect of the prolonged action of water on the red corpuscles; the nuclei are now not merely circular, but most of them have become eccentric, and certain of them have escaped altogether from the membranous capsular portion of the corpuscles, which and the nuclei are seen lying side by side as distinct structures.

5. The nuclei, separated from the capsule by the action of acetic acid.

6. Shows the extraordinary deformity and elongation of which the red blood corpuscles are susceptible when subject to any extending force, or even to lateral pressure. In the figure, the extension has been exerted on the corpuscles by means of the filaments which fibrin in coagulating runs into, and a portion of one of which may be seen uniting the corpuscles.

Plate II

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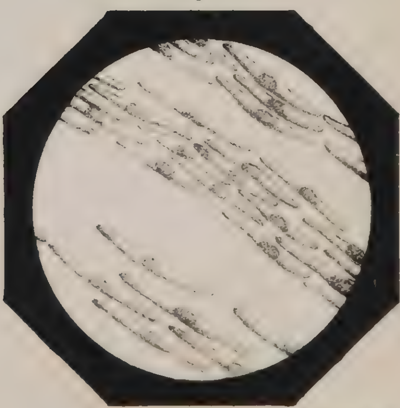

E. Vi... ad. E. . Kellogg lith.

PLATE III.

The figures in this plate are magnified 670 diameters.

For the blood from which the figures contained in this plate were made, as well as some of those of the following plate, I am indebted to the kindness of Mr. Ogilby, the Secretary of the Zoological Society, who, on my application to him, promptly and courteously forwarded to me the permission requisite to enable me to obtain it.

Fig. 1. The red and white blood corpuscles of the dromedary; in water, the former became perfectly spherical.

2. The same, of the Siren.

3. The same, of the Alpaco.

Plate III.

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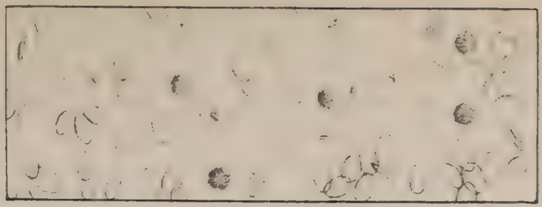

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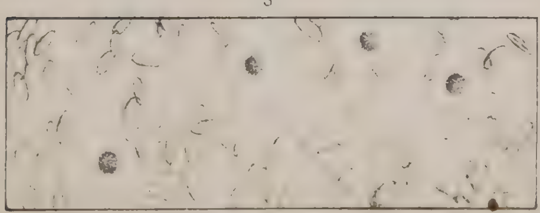

PLATE IV.

The figures in this plate are magnified 670 diameters.

Fig. 1. Represents the blood corpuscles of the elephant, red and white, which are the largest hitherto discovered among the mammalia.

2. Exhibits the blood corpuscles of the goat, both red and white, which are among the smallest as yet made known in the class to which they belong.

3. Peculiar concentric corpuscles, taken twenty-four hours after death from a polypus contained in the heart of an old man.

4. A portion of fibrin, removed from a small cavity situated beneath the buffy coating formed on some blood which had been abstracted from a woman, the subject of epileptic fits, and for which she was bled; it exhibits the granular and fibrous structure, which the spontaneously coagulable element of the blood invariably assumes in solidifying.

5. A portion of fibrin, constituting the buffy coat, and which formed a thick membrane on the surface of the blood abstracted from the woman already alluded to; it exhibits more clearly the fibrous construction of the fibrin, the fibres being rendered more apparent by the action of corrosive sublimate, and also some of the white corpuscles which are found usually in such abundance in the so-called inflammatory crust. All false membranes have a constitution precisely similar.

6. Blood corpuscles of the earth-worm in various states; those contained in the lower half of the circle represent them as they appear in the *liquor sanguinis*, or *plasma*, in which most of the corpuscles speedily assume a stellate form, as do those of most of the invertebrate animals, and in which state they bear a close resemblance to the hispid pollen granules of the order *Compositæ;* the stellate form of the

corpuscles is speedily followed by their considerable enlargement, rupture, and disaggregation; the corpuscles represented in the upper half of the circle have been acted upon by water, in which they quickly lose their radiate aspect, swell, increase to two or three times their original dimensions, exhibit their contained molecules more clearly, and which may frequently be seen in a state of the greatest activity; finally, the corpuscles become deformed in shape and burst. It may here be remarked, that the blood of most of the *Invertebrata* is colourless, arising from the fact of their blood containing but one form of corpuscle, the colourless blood corpuscle. In the *Annelidæ*, indeed, the blood is red; the colouring matter, however, is not contained in the corpuscle, but in the plasma.

Plate IV.

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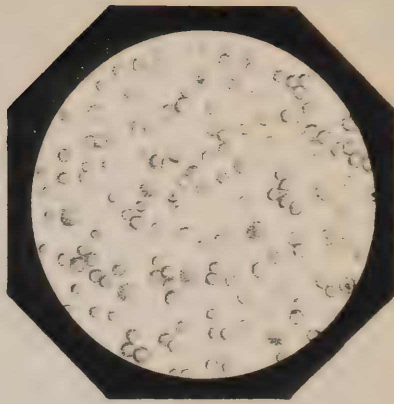

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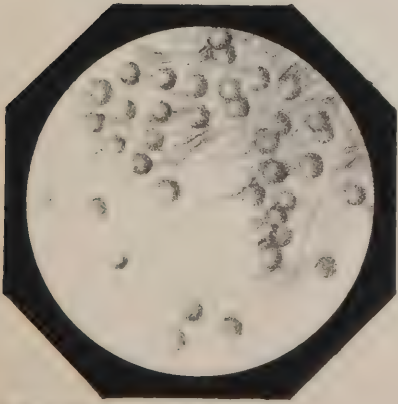

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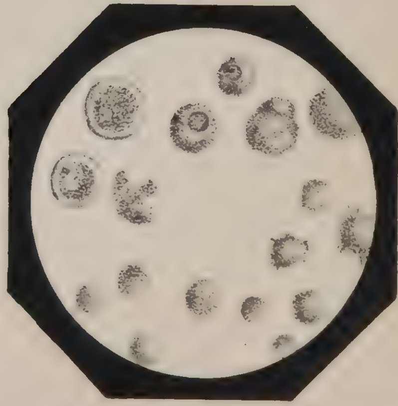

H. M[illegible] del. E. [illegible] lith.

PLATE V.

The figures in this plate are magnified 350 diameters.

Fig. 1. Exhibits the circulation in a portion of the tongue of the frog, the larger vessel is seen to be accompanied by a nerve, as is usually the case, and in all the vessels are shown the red and white corpuscles, with their differences of form, size, structure, colour, and position; the general direction and appearance of the muscular fibres, are likewise indicated.

2. Represents the distribution of the smallest capillaries in the web of the foot of the frog, in which it is seen that the blood corpuscles circulate only in single series, the pigment cells, cellular tissue of the parenchyma, and the beautiful hexagonal and nucleated tessellate epidermis are likewise exhibited.

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H. Muller del. E. C. Kellogg lith.

PLATE VI.

Fig. 1. Is a more highly magnified representation of the circulation in the capillaries of the web of the foot of the frog; in it the white and red corpuscles as well as the epidermis are more clearly defined; two of the white corpuscles are seen to be of an oval form, resulting from compression between the red blood discs and the walls of the vessels. This figure is magnified 670 diameters.

2. Exhibits a portion of a larger vessel also taken from the web of the foot of the frog; in it the white corpuscles are seen to have collected in considerable quantity, as they are frequently observed to do after long exposure of the web to the action of the air; two cells or globules of a very peculiar structure are likewise figured; these open on the surface, and possibly are mucous crypts. This representation is magnified 900 diameters.

Plate VI.

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PLATE VII.

Obs.—It is scarcely necessary to observe, that the comparative anatomy figures are introduced in this work for the purpose of illustrating, in a more satisfactory manner than could be otherwise accomplished, certain points, especially the more obscure ones, connected with human anatomy.

These figures should, therefore, by no means be regarded as taking the place of any of those which should illustrate human anatomy, and not one of which, deemed to be of importance, will on any account be omitted; they should be deemed not as *substitutes*, but as *additions* to the original design of the work, and which cannot but enhance very considerably its value.

Fig. 1. Represents a portion of the under surface of the tongue of the frog, magnified 130 diameters, and on which are seen, first, numerous glands, mostly spherical, and traversed by a tortuous vessel, in which the blood corpuscles are tossed about as it were in a vortex; and, second, mucus crypts, the apertures of which are apparent. Donné has observed these bodies, but believes them to be formed by nervous loops, and appears to have overlooked the orifices alluded to: these I found to be figured in a drawing of the tongue of the frog, sent me by Dr. Waller, but unaccompanied by any explanation.

Fig. 2. A portion of the same, magnified 500 diameters, showing the incurrent and excurrent vessel of the gland, the mucous crypts, and the net-work formed by the epithelium.

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H. M.

E. C. Keilbag lith

PLATE IX.

The figures in this plate are magnified 670 diameters.

DEVELOPMENT AND DISSOLUTION OF THE RED BLOOD CORPUSCLE.

Fig. 1. Represents the development of the red blood corpuscle of the embryo fowl, on the third day of its growth, obtained from one of the vessels of the *area vasculosa:* this is seen to be of many different sizes, the smaller being scarcely a third the volume of the larger discs, and consisting of but little more than a nucleus and an envelope. Numerous molecules are likewise visible, scattered over the field.

Fig. 2. The same, in water.

Fig. 3. The red blood corpuscles of the adult fowl, mostly in different stages of dissolution; the larger and deeply coloured corpuscles represent the fully-developed discs; the larger and pale ones, with the distinct nuclei, those the dissolution of which has just commenced; the smaller and colourless ones, red blood discs in advanced stages of dissolution, the sole remains of which at length is the nucleus, also represented in the figure.

Fig. 4. The red blood corpuscle of the young frog in different stages of development. First, it is seen as a small and granular body of a *circular* form; secondly, it assumes an oval shape, but still retains its granular constitution, and but little exceeds its former dimensions. In this its second stage of development, it is still colourless: it soon, however, grows in size, and acquires a greater or less degree of colouration; so that when it has attained one-half or two-thirds of its size, it is nearly as deeply coloured as the full-grown blood disc: the colourless granular nucleus and the coloured and perfectly smooth outer portion of each globule are not at first distinctly

separated from each other, the former being at its origin rather large, and without any defined margin: it soon, however, shrinks in size, and assumes a regular oval shape. Crescentic bodies, occasionally met with in the blood of the frog, and probably of vegetable nature, are also represented in the figure.

Fig. 5. The red blood corpuscle of the adult frog, in different stages of dissolution. In examining a drop of the blood of a full-grown frog, a much greater uniformity in the size of the red blood discs will be observed, than exists in that of the very young animal, fewer corpuscles being in process of development in the former than in the latter.

Fig. 6. Blood corpuscles of the adult frog united into chains, an arrangement which appears to be intimately connected with the coagulation of the fibrin.

Plate IX.

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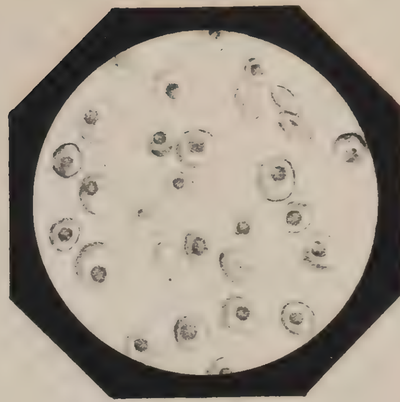

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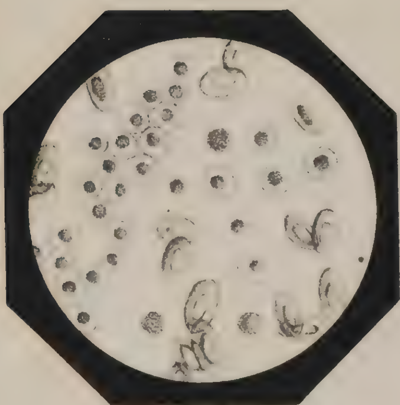

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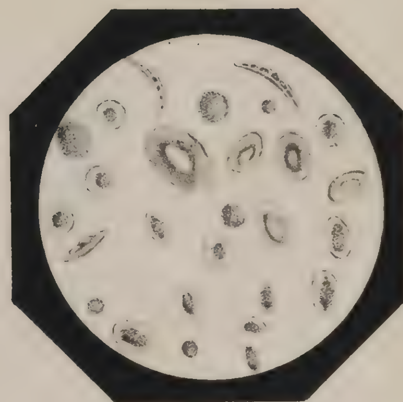

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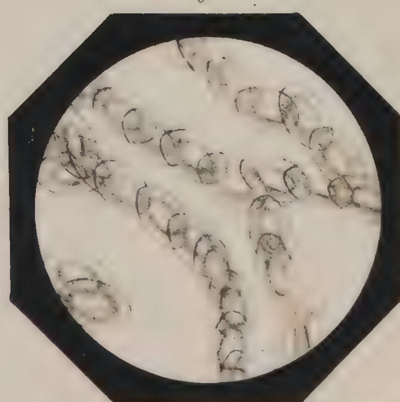


PLATE X.

The figures in this plate are magnified 670 diameters.

DEVELOPMENT OF THE EMBRYO OF THE CHICK.

Fig. 1. The appearance of the *cicatricula* in the yolk prior to incubation.

Fig. 2. The same at the end of the first day of incubation; the *halones* are now distinctly visible, as also the *area pellucida*, and *nota primitiva*, or first rudiment of the young chick.

Fig. 3. The same at the termination of the thirty-sixth hour of incubation; the *halones* have become more marked and expanded, the *nota primativa* larger, and traces of blood-vessels are now for the first time distinctly visible in the germinal membrane.

Fig. 4. The same at the close of the second day; the pulsation of the heart and the vessels of the *area vasculosa* are clearly visible; within them the coloured corpuscles may be seen circulating.

Fig. 5. The same at the end of the third day of development; the *area vasculosa* has now extended itself to two or three times its former dimensions.

Fig. 6. The embryo on the conclusion of the fourth day; the head, the eye, and the budding of the *allantois* are now seen in addition to the parts previously noticed.

Fig. 7. The embryo at the termination of the fifth day; the wing and the foot have made their appearance; the limits of the *area vasculosa* cannot now be seen, it extending over two-thirds of the surface of the egg; after this and the following day, the periods of its complete development, the *area* suffers an arrest of growth, and the vessels contract and carry but little blood, until at length they are entirely obliterated. The *allantois* has on this day attained a considerable size. and its further growth proceeds with the utmost rapidity.

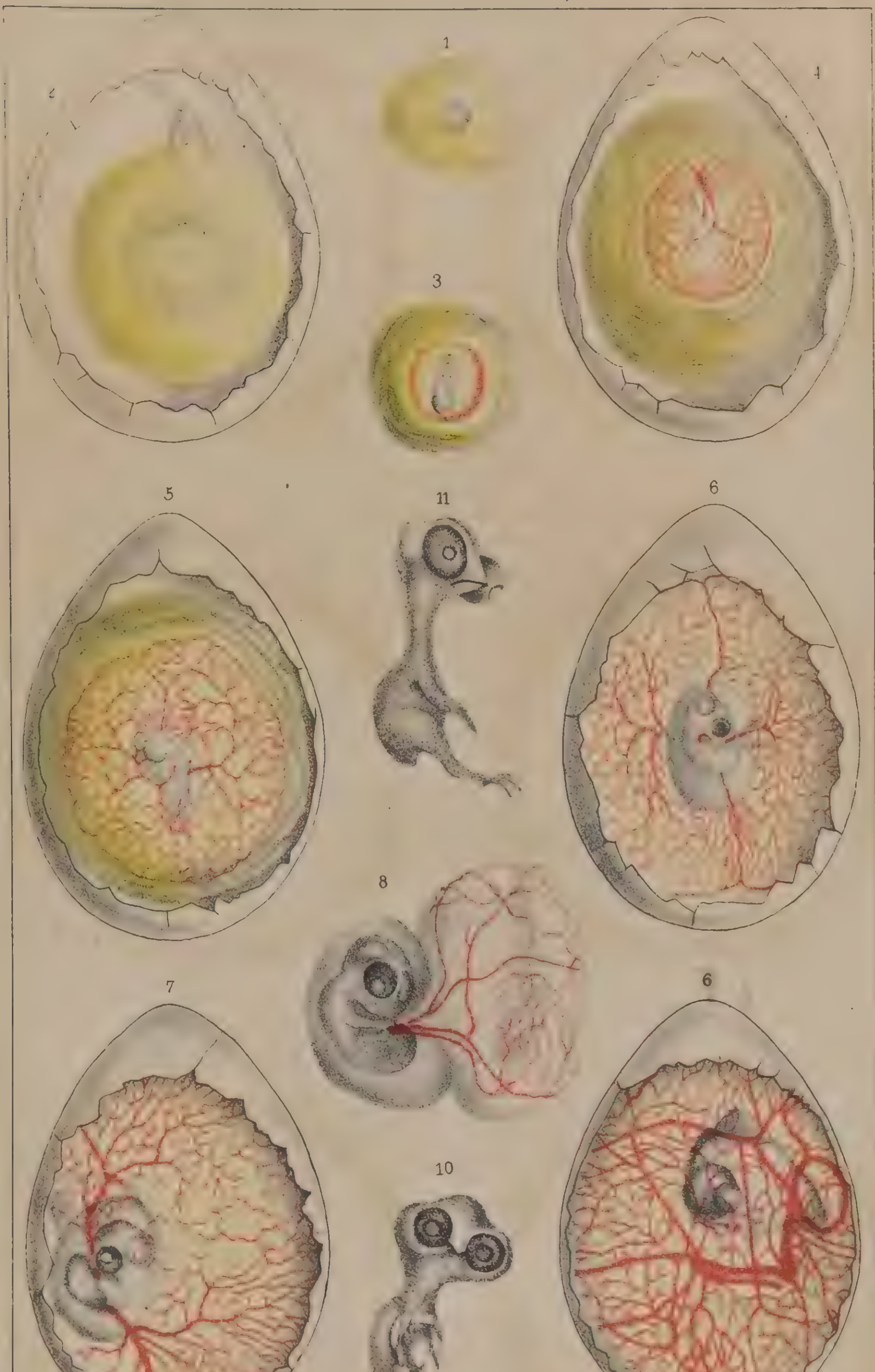
Fig. 8. The embryo six days old with the *allantois* separated from the *area vasculosa* and the yolk, &c.

Fig. 9. The embryo of the ninth day of development, seen through the *allantois*, which now invests nearly the entire surface of the yolk, and beneath which the collapsed and faintly coloured vessels of the *area vasculosa* may still be discerned. The purpose fulfilled by the distribution of such innumerable vessels in the membrane of the *area vasculosa*, and subsequently in the *allantois*, is but temporary, and is doubtless connected with respiration, the blood in these vessels being submitted to the influence of the oxygen of the air, which enters the egg through the pores contained in its shell; the vital fluid is thus regenerated and afterwards rëconveyed to the embryo itself, from which it first proceeded. At the completion of the development of the chick, the *allantois* undergoes the same obliteration of its vessels which the *area vasculosa* previously suffered.

Fig. 10. The embryo at the end of the seventh day of development removed from its membranes.

Fig. 11. The same at the end of the ninth day, also separated from its membranes.

Such is a brief sketch of the marvellous development of the embryo of the chick.



F Miller del

E C Kellogg lith

PLATE XI.

The figures in this plate are magnified 670 diameters.

MUCUS.

Fig. 1. Mucus corpuscles of their ordinary size, form, and appearance.

Fig. 2. The same collapsed, owing to the density of the fluid in which they are contained; these corpuscles are capable of resuming the circular form by the addition of water.

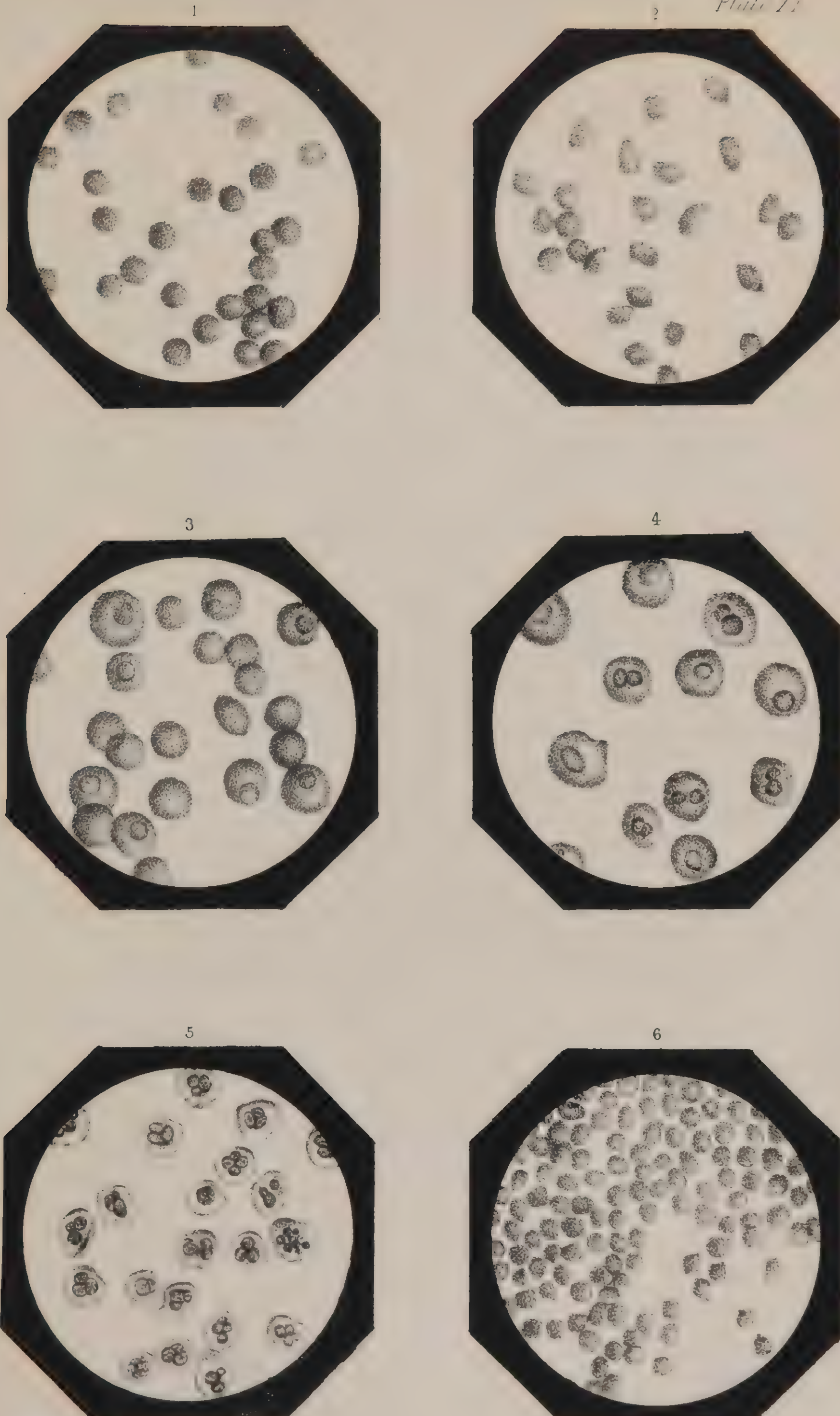
Fig. 3. Represents the action of water on the mucus corpuscles, in which they increase very considerably in dimension, the nucleus which is usually single becoming at the same time more distinct.

Fig. 4. The same acted on by very dilute acetic acid, under the influence of which the originally single nucleus becomes divided into two parts, the portion of the corpuscle external to these remaining granular.

Fig. 5. Exhibits the action of undilute acetic acid, under which the nucleus becomes divided into from two to five or even more parts, the enveloping portion of the corpuscle losing its granular texture, and appearing perfectly smooth and transparent.

Fig. 6. Mucus corpuscles in process of development, expressed from the cavity of a gland situated in the mucous membrane lining the upper portion of the rectum of a child who died of English cholera.

Plate VI



H. Miller del. F. C. [illegible] lith

PLATE XII.

The figures in this plate are magnified 670 diameters.

MUCUS.

Fig. 1. Represents an example of vaginal mucus obtained during parturition, and containing blood corpuscles.

Fig. 2. Is a representation of œsophageal mucus.

Fig. 3. Exhibits the mucous corpuscles contained in some bronchitic mucus, and obtained from a patient labouring under chronic bronchitis. The mucus was ropy and tenacious, and many of the corpuscles were rendered of an oval form by the pressure exerted upon them by the filaments, of which the fluid portion of true mucus is constituted.

Fig. 4. Vegetation contained in the same mucus as that from which the previous figure was made.

Fig. 5. Mucus from the stomach.

Fig. 6. Is a representation of the vaginal tricho-monas of Donné, copied from the atlas appended to the "Cours de Microscopie."

It may here be observed that the above is the only instance of a copied figure being introduced into this work, and that in no case where it is possible to procure subjects for original drawings, will copied ones be admitted.

Plate XII

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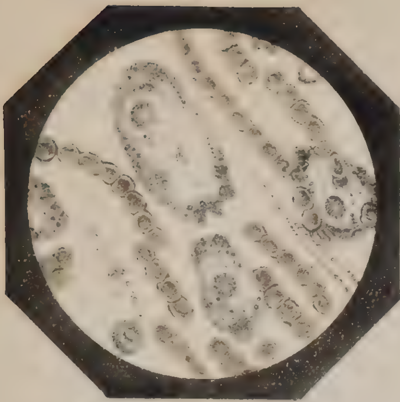

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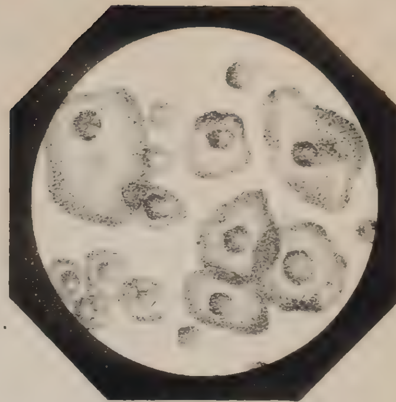

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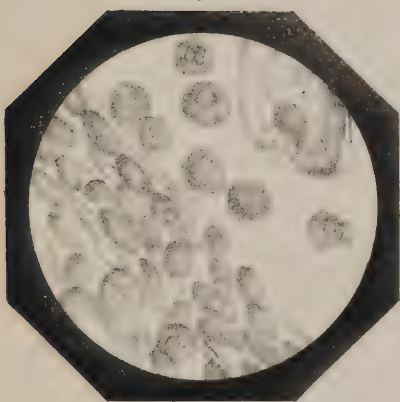

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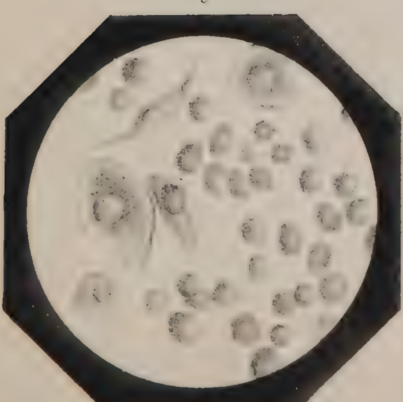

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PLATE XIII.

The figures in this plate are magnified 670 diameters.

PUS.

Fig. 1. Is a representation of an example of laudable pus formed on a granulating surface on the arm of a child, the consequence of a burn. In this figure, one or two oil globules are likewise introduced.

Fig. 2. The same acted on by acetic acid, and showing the compound nuclei.

Fig. 3. Pus corpuscles treated with water, many of them exhibiting but a single nucleus. This example of pus was obtained from a pustule formed around the root of the nail, and induced by a prick received during dissection.

Fig. 4. Epithelial scales remarkable for the great size of their nuclei, and obtained from a small pustule situated beneath the nail of one of the fingers, and which pustule was also the result of a prick received in dissecting.

Fig. 5. An example of pus obtained from an old scrofulous abscess: the corpuscles in it are seen to be mostly broken up into the primary molecules of which they are constituted.

Fig. 6. An example of venereal pus, showing the peculiar animalcules described by Donné.

The whole of the figures contained in this and the two preceding plates illustrate human microscopic anatomy.

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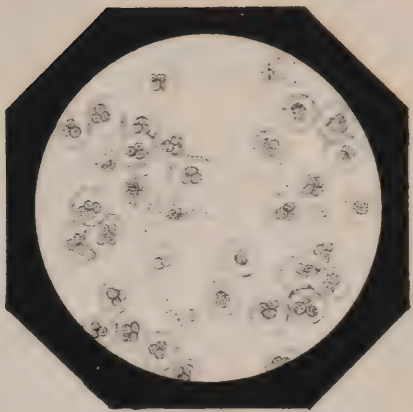

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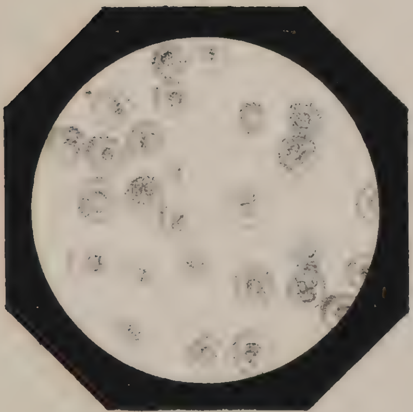

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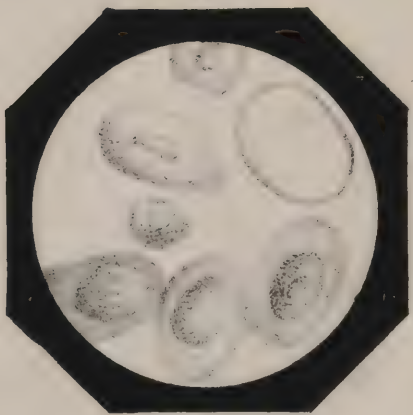

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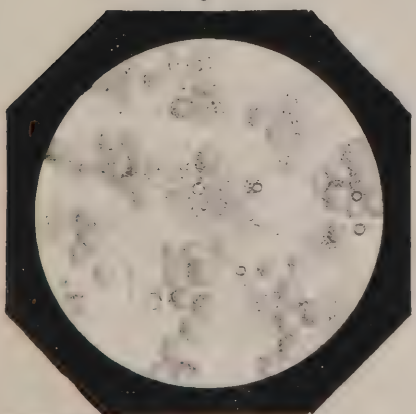

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Miller del

Kellogg lith

PLATE XIV.

The figures in this plate are magnified 670 diameters.

MILK.

Fig. 1. The globules of the healthy milk of a woman.

Fig. 2. The globules contained in impoverished human milk, which are seen to be smaller in size and fewer in number than in ordinary milk.

Fig. 3. An example of colostrum, on the first day, obtained from a young woman aged nineteen, delivered of her first child, and showing the size and arrangement of the ordinary milk globules, as well as the structure and appearance of the peculiar colostrum corpuscles.

Fig. 4. The same colostrum of the same age, containing a greater number of the colostrum corpuscles.

Fig. 5. The same colostrum, on the same day, exhibiting the great size of the cream globules, which appear frequently to present rather the aspect of oil than that of true milk globules.

Fig. 6. The milk globules aggregated into masses, as occurs in cases of engorgement of the breast.

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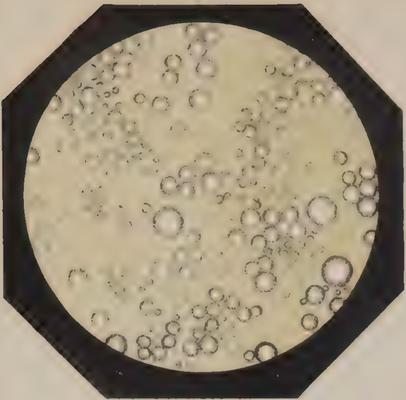

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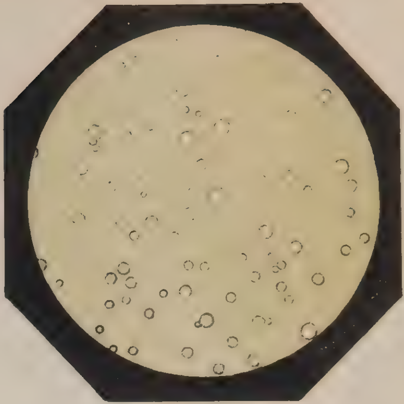

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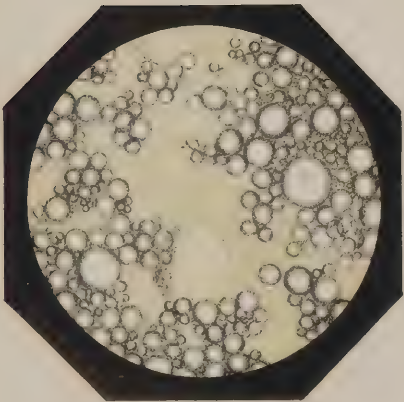

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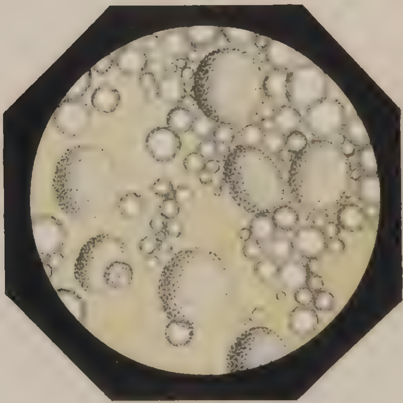

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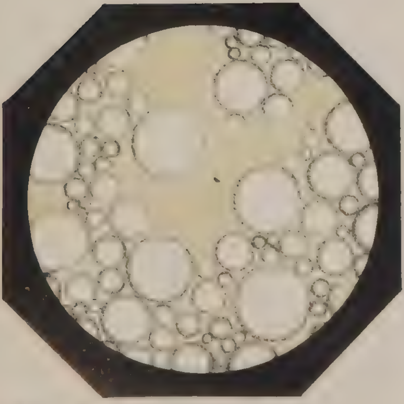

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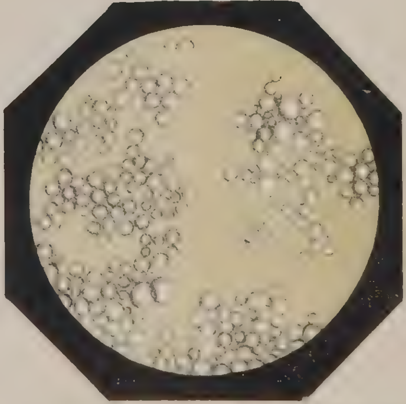

PLATE XV.

The figures in this plate are magnified 670 diameters.

MILK.

Fig. 1. An example of pus in the milk of woman.
Fig. 2. The same of the blood corpuscles in human milk.
Fig. 3. The appearance of the milk after treatment by ether.
Fig. 4. The same after the application of acetic acid.
Fig. 5. Caseine precipitated from the filtered serum by acetic acid.
Fig. 6. A specimen of the milk of the cow in which adulteration with starch was revealed by treatment with the iodide of potassium.

For many of the examples of human milk upon which my observations were made, and from which several of the figures were prepared, I am indebted to the kindness of Dr. Robert Barnes, District Surgeon to the Queen Adelaide Lying-in Hospital.

Plate I.

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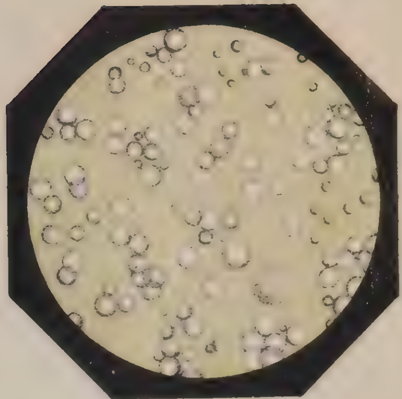

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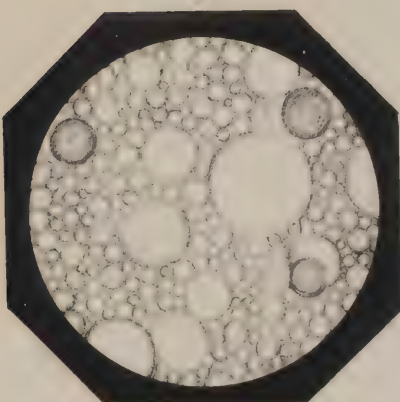

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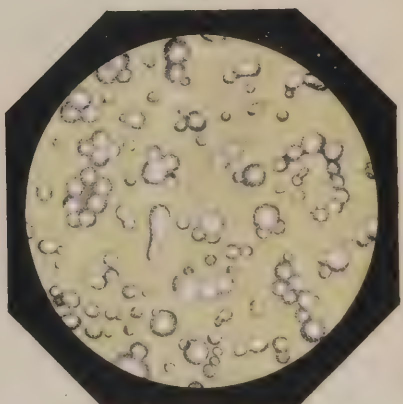

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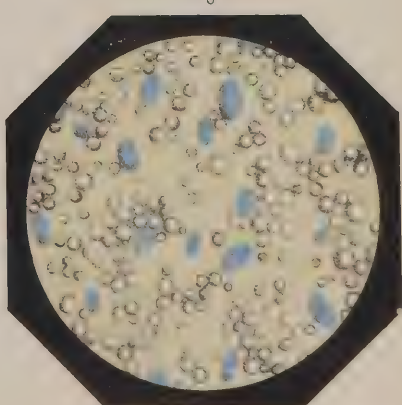

PLATE XVI.

SEMEN.

Fig. 1. The spermatic animalcules and "seminal granules" contained in the human semen as ejaculated, magnified 900 diameters, and to which are added several spermatophori, magnified to the same extent, and introduced to render the representation of the development of the spermatozoa of man more complete. The larger seminal granules mostly contained a single distinct nucleus, which renders it probable that they are spermatophori in progress of development.

Fig. 2. Represents the several stages of evolution of the spermatic animalcules of *certhia familiaris* (common creeper); *l*, an adult spermatozoon, taken from the orifice of the vas deferens; *a*, seminal granule, procured from a very collapsed testicle in the winter season; *b* to *k*, spermatophori in different stages of development, taken from a testicle in summer, during turgescence. Magnified 900 diameters.

This figure is copied from Wagner's "Elements of Special Physiology."

Plate XVI

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H. M[illegible]ler del.

E. C. Ke[illegible]

PLATE XVIII.

The figures in this plate are magnified 130 diameters.

FAT.

Fig. 1. A portion of the great omentum of a child aged seven years. The fat cells are seen to be small, perfectly globular, and aggregated into clusters, which lie near to and in the course of the blood-vessels.

Fig. 2. A portion of the fat of an adult taken from over the gluteus muscle. The fat cells in it are observed to be of larger size, and many of them are polyhedral; these cells are also seen to be held in union by an enclosing membrane of cellular tissue.

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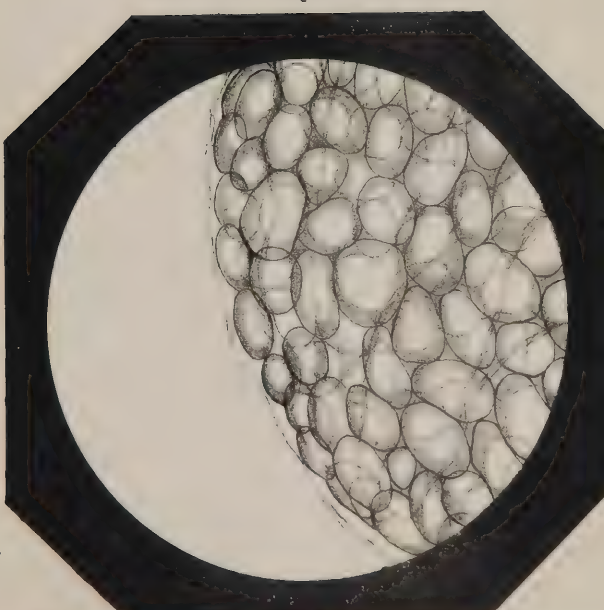

H Miller del

E C Kellogg lith

PLATE XIX.

The figures in this plate are magnified 130 diameters.

FAT.

Fig. 1. Fat vesicles of the pig, in which the appearance of a nucleus was produced by moderate compression between two plates of glass.

Fig. 2. The fat vesicles of the pig, ruptured by compression between two plates of glass: the contents of the cells are seen escaping from their enclosing membranes.

Fig. 3. Fat cells, forming part of the marrow contained in the femur of a child aged about ten years; in these a large nucleus-like body is visible, the formation of which probably depended upon a change in the condition of the contents of the cells induced by decomposition.

Fig. 4. The same cells in a further stage of decomposition: the membranes of the cells have become ruptured, and are clearly seen broken and empty, lying beside their escaped contents, which either become broken up, and assume the form of drops of oil of different sizes, or remain entire, in which case they frequently exhibit the crystalline appearance portrayed in figure 5.

Fig. 5. Human fat vesicles, on the surface of which crystals, supposed to be those of margaric acid, radiating from a centre, have appeared: their presence is to be regarded as an indication that decomposition has begun to affect the contents of the cells.

Fig. 6. Fat cells, contained in a small melicerous tumour removed from over the nasal bones, in all of which a nucleus-like body was clearly visible.

The tumour from which the figure was taken was kindly forwarded for examination by Mr. Ransom, of the University College Hospital.

Plate XIX.

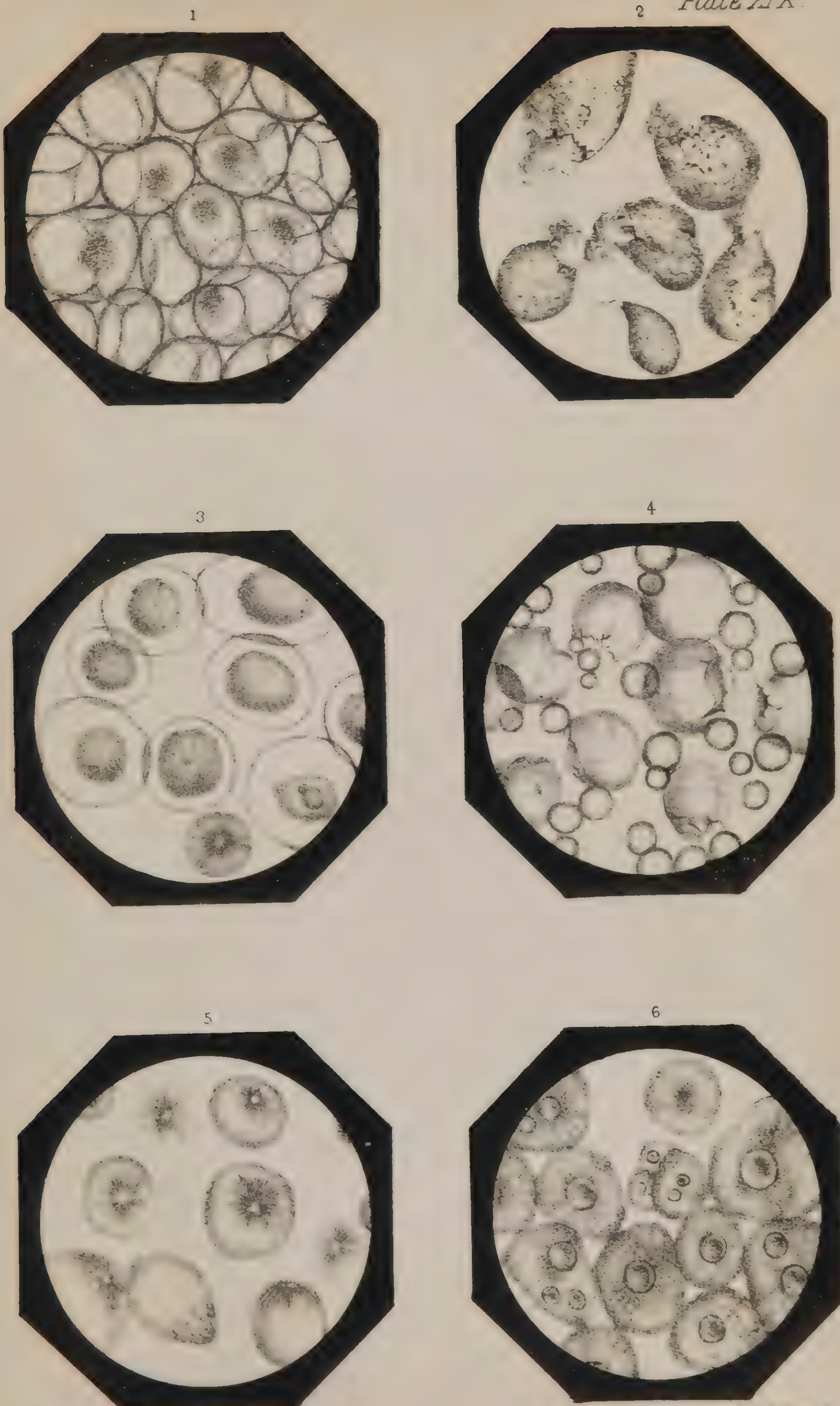

PLATE XX.

The figures in this plate are magnified 670 diameters.

Fig. 1. Buccal epithelial cells in different stages of development, from their earliest condition, in which they bear the form of mucous corpuscles, to their fully developed state. For a representation of the epithelial cells of the vagina and œsophagus, see Plate XII. *figs.* 1 and 2.

Fig. 2. Cylindrical or cuneiform epithelial cells, taken from the duodenum of a child seven days old: those of the adult are in every respect identical; the group of angular cells at the inferior part of the figure represents the summits of the cuneiform epithelial cells.

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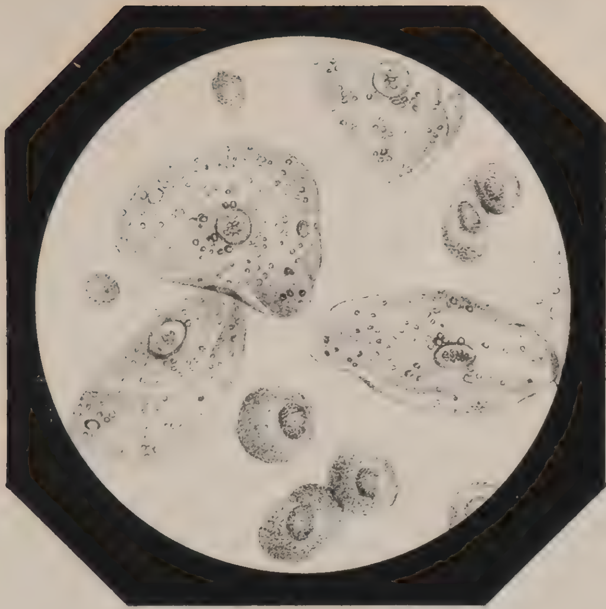

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PLATE XXI.

The figures in this plate are magnified 670 diameters.

Fig. 1. Ciliary epithelium from the trachea of the frog: it will be seen that the form of the cells is very different from that of mammalia.

Fig. 2. Human ciliary epithelium contained in the fluid expressed from a portion of lung taken from its extreme periphery, and apparently consisting of air cells alone. It is mixed up with cells of tesselated epithelium.

Fig. 3. Human ciliary epithelium from the trachea; both side and end views of the cells are given.

Fig. 4. Tesselated epithelium from the tongue of the frog.

Fig. 5. Tesselated epithelium from the tongue of the Triton: the nuclei are seen to be very large, their great size affording an illustration of the law which has already been announced, viz: that all the corpuscular elements of the animal organization, whether those of the epithelium, the glands, cartilages or muscles, stand in relation with the dimensions of the blood discs; where these are large, the other corpuscles are formed on a similar relative scale.

It is probable that the law admits of extension, and that all the elements of the animal structure bear a relation in size to the red blood discs.

Mr. John Quekett made the interesting observation, some time since, that the relative size of the lacunæ of bone corresponded with that of the blood corpuscles, a further illustration of the accuracy of the law referred to.

Wishing to test the truth of this law in as satisfactory and conclusive a manner as possible, I applied to Professor Owen for a specimen

of the Siren or Proteus, animals remarkable for the dimensions of their blood discs, and that gentleman kindly placed at my disposal an example of the *Meno-branchus lateralis*, a member of the same perenni-branchiate group, and the blood corpuscles of which "are rather larger than those of the Proteus, but not so large as those of the Siren." In this animal I found, as I had anticipated, that the soundness of the law was fully maintained.

The law announced would doubtless be cited by those physiologists who entertain the idea that all the corpuscular elements of the animal fabric proceed from the red blood disc, as a proof of the truth of their theory, against which, however, I conceive that sound and conclusive arguments may be urged.

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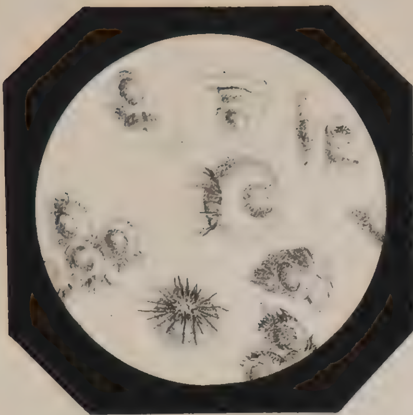

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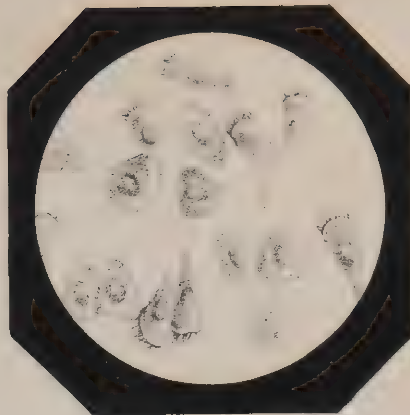

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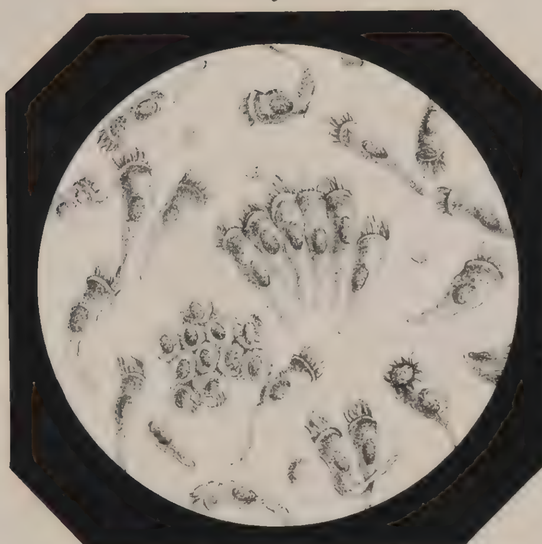

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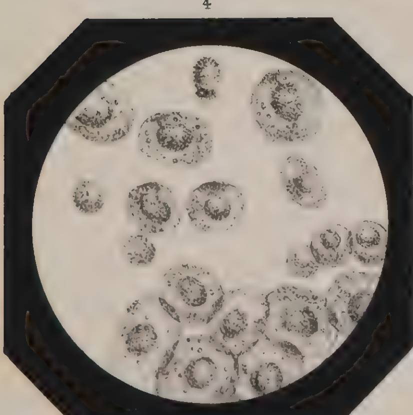

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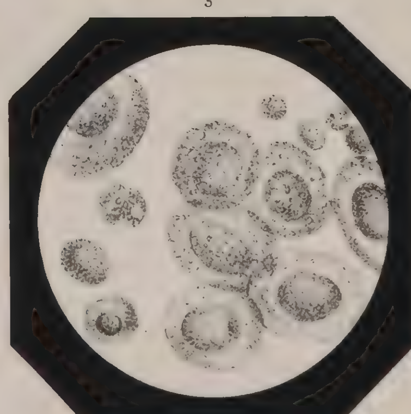

H. Miller del.

E. C. Kellogg lith.

ALL THE FIGURES IN THIS PLATE ARE HUMAN.

PLATE XXII.

The figures in this plate are magnified 670 diameters.

Fig. 1. Tesselated epithelium from the serous coat of the liver; from some of the cells the nuclei have escaped.

Fig. 2. Ditto from the choroid plexus; the spines described by Henle as proceeding from the angles of the cells must be of unusual occurrence, as I have never yet seen them.

Fig. 3. Ditto from the vena cava inferior in different stages of development, from the white corpuscle of the blood upwards.

Fig. 4. Ditto of the arch of the aorta; some of the cells are seen to have lost their nuclei.

Fig. 5. Ditto from the surface of the uterus of a woman who died suddenly during lactation.

Fig. 6. Ditto from the internal surface of the pericardium.

Plate XXII

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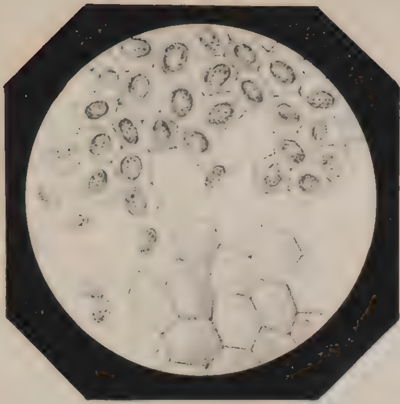

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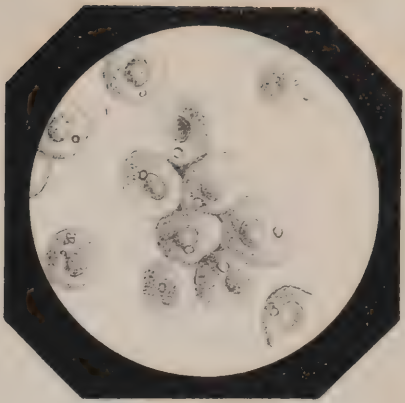

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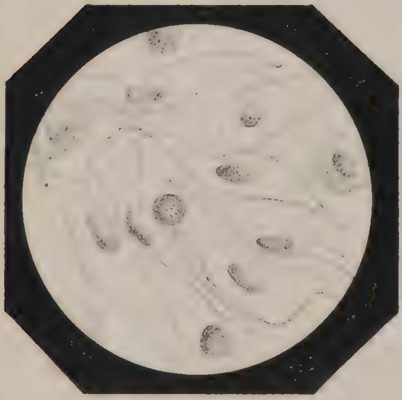

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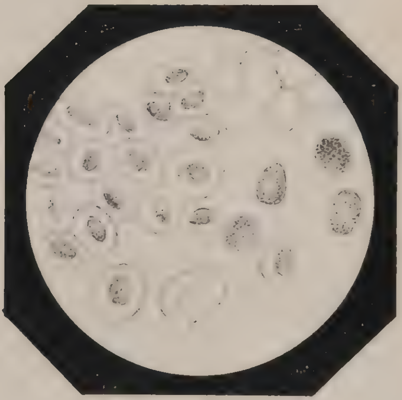

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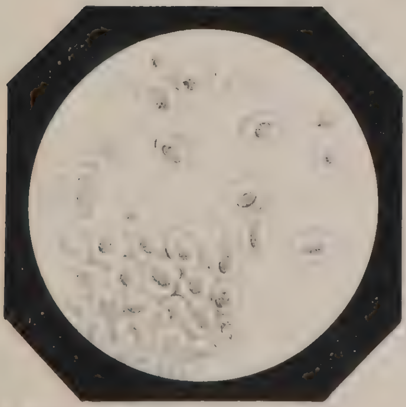

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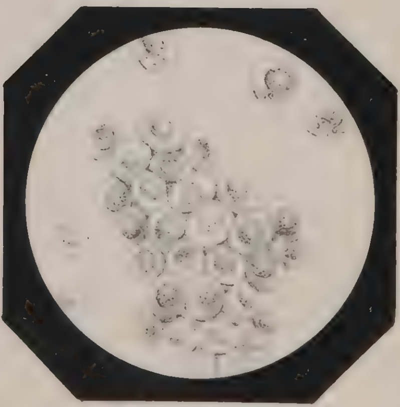

[illegible] Miller del. [illegible]

PLATE XXIII.

Fig. 1. Upper surface of epidermis, raised by means of a blister from over the region of the heart of a woman: it exhibits the cellular constitution of the epidermis, the papillæ and apertures of the sebaceous and sudoriferous glands. 130 diameters.

Fig. 2. The under surface of the same, exhibiting the infundibuliform processes of the epidermis sent down to the sebaceous and sudoriferous glands. 130 diameters.

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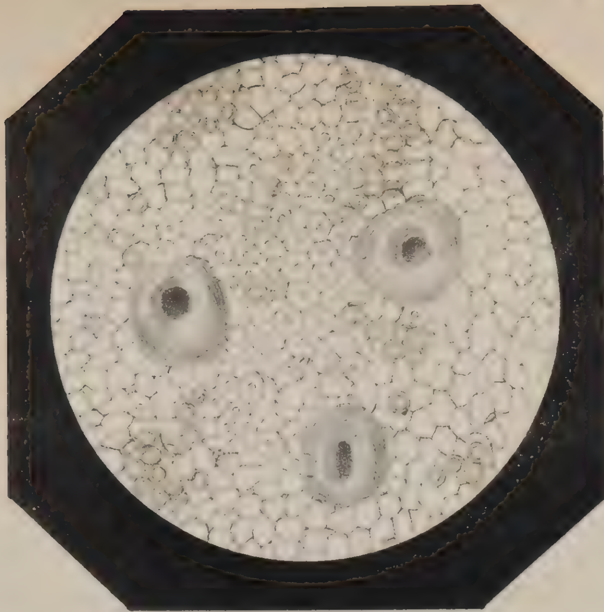

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PLATE XXIV.

STRUCTURE OF EPIDERMIS.

Fig. 1. A portion of the epidermis of the palm of the hand, magnified with a simple lens, showing the direction of the rugæ in that situation, and the arrangement of the apertures of the sudoriferous glands. Each of the ridges figured is made up of square compartments, the divisional lines of which run at right angles to the ridges, passing across the apertures referred to. These several compartments again are indented on their under surface with the papillæ of the sensitive skin.

Fig. 2. A portion of the same, magnified 100 diameters.

Fig. 3. A transverse section of the ridges of the epidermis of the palm of the hand, showing a side view of the apertures of the sudoriferous glands, their spiral ducts, the thickness of the epidermis in the situation mentioned, its composition of super-imposed layers of cells, and its mode of connexion with the true skin. 100 diameters.

Fig. 4. A longitudinal section of one of the ridges, magnified to the same extent as the previous figure, viz: 100 diameters: in this the composition of the thickened epidermis of adherent layers of cells is better seen, and the difference in the form of the superficial and deeper seated cells may also be observed.

Fig. 5. A portion of the epidermis removed from the back and outer part of the hand, showing the disposition of the folds in that situation, the arrangement of the papillæ, the disposition of the hair follicles and hairs, and the apertures of the sudoriferous and sebaceous glands. Magnified with a simple lens.

Fig. 6. A piece of the same, magnified 100 diameters, showing that each line is a furrow or groove, a provision which allows of a very great extension of the epidermis.

Plate XXIV

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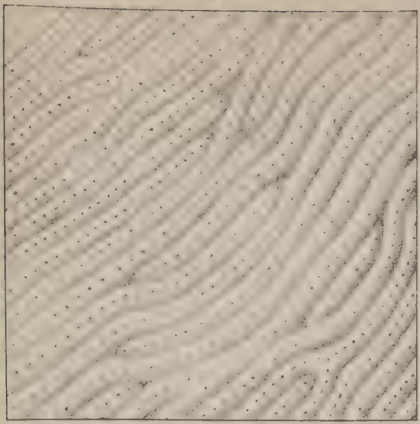

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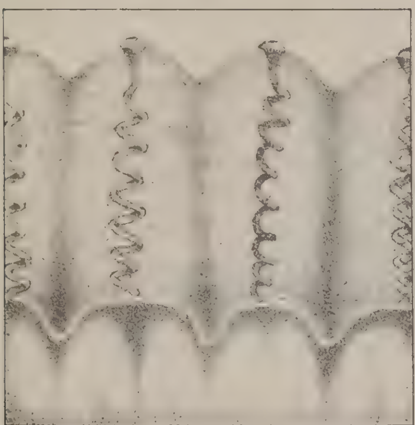

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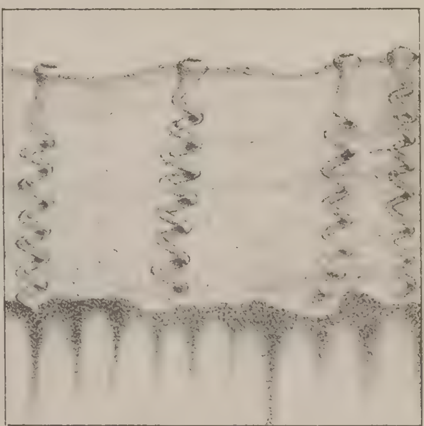

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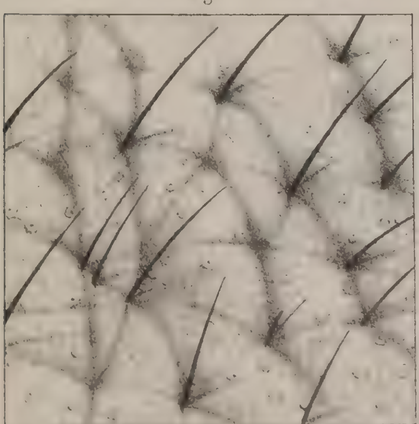

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PLATE XXV.

STRUCTURE OF NAILS.

Fig. 1. A longitudinal section of the nail of the middle finger, magnified 130 diameters, showing the direction of the striæ or laminæ of cells of which the nail is composed, and which usually pass from above downwards and forwards. In the section shown in the figure, the obliquity of the striæ is but slight; the under surface of the nail is distinguished from the upper by its smooth outline.

Fig. 2. The same, in which the striæ are disposed more obliquely, but in a contrary and unusual direction; viz: from above downwards and backwards. 130 diameters.

Fig. 3. Other longitudinal sections, in one of which the striæ run, almost vertically. 130 diameters.

Fig. 4. A transverse section of nail, magnified to the same extent as the former figures; in it the striæ are parallel to the surface, and are less strongly marked.

Fig. 5. The detached cells of which the super-imposed layers of nails are composed; the smaller cells are magnified 130 diameters, the larger 670.

Fig. 4. Plate XXVI. represents the peculiar and beautiful manner in which the nail and the papillary layer of the true skin are united.

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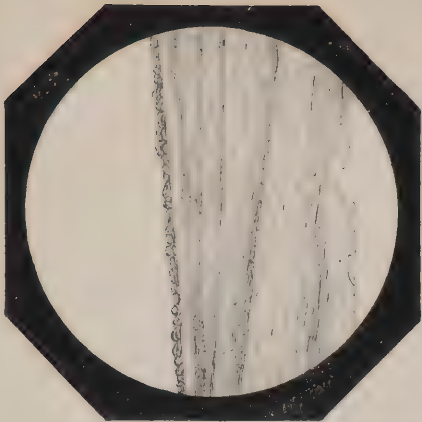

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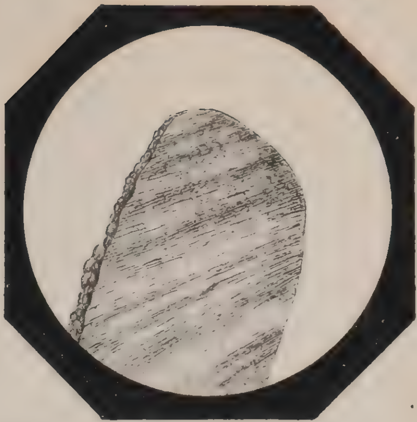

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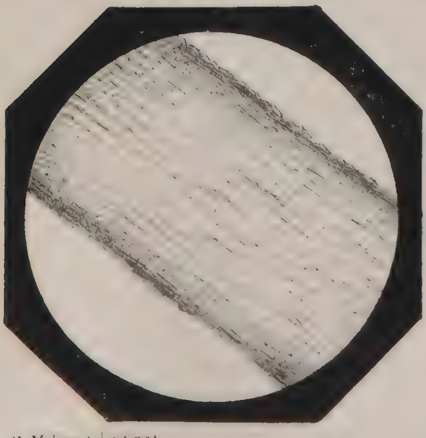

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H Miller del ad nat

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PLATE XXVI.

STRUCTURE OF EPIDERMIS, ETC.

Fig. 1. A portion of epidermis taken from the back and outer part of the hand, magnified 100 diameters, and viewed on its upper surface, showing the elevations by which it is marked, and which are produced by the papillæ of the true skin.

Fig. 2. The same viewed on the under surface, showing the depressions occasioned by the papillæ. The number of apertures of the ducts of the sudoriferous and sebaceous glands is, in reference to that of the papillæ, about one of the former to six or seven of the latter. 100 diameters.

Fig. 3. A portion of epidermis, magnified 100 diameters, removed from over the pubis of a woman, and displaying the apertures of the hair follicles, and the manner in which the hairs issue from them. Some of the follicles contain but a single hair, others two or even three: it is probable that this last is the normal number of hairs enclosed in each follicle wherever situated, but which in the adult is not generally encountered in consequence of the continual removal to which hairs are subject. It is about the apertures of the hair follicles that the scurf is formed, and concerning which a very erroneous notion prevails, viz: that it is constituted of desquamated epidermis. Scurf does not in the least exhibit the structure of epidermis, but simply consists of the inspissated secretion of the sebaceous glands, and many of which, opening into the hair follicles, account for its collection around their orifices.

Fig. 4. A transverse section of the nail of the middle-toe of an adult, magnified 100 diameters, showing its lamellated structure,

and the mode of its connexion with the papillary layer of the dermis by mutually inter-locking processes. This mode of union is excessively firm, and is precisely that employed by carpenters, and known by the appellation of "dovetailing."

Fig. 5. A portion of epidermis removed from the back of the neck by means of a blister, and magnified 670 diameters. The younger cells are seen to be filled with a straw-coloured fluid, the serum extracted through the agency of the vesicant.

Fig. 6. A. Some detached cells of epidermis, obtained by scraping the sole of the foot, magnified 670 diameters. Cells in a similar state exist beneath the nails, around the nipple, and on the surface of the body of new-born children where the creamy scum formed by them and inter-mingled with fatty matter poured out by the sebaceous glands has been named *Vernix caseosa.* (See C.)—B. Cells of some, magnified 130 diameters.—D. Cells of epithelium from the mouth of the *Menobranchus lateralis:* they are introduced for the purpose of showing the accuracy of the law of the relation in size of the several elements entering into the composition of the animal frame.—E. Two or three epithelial cells of the lateral ventricles of the brain. I have recently ascertained that the epithelium of the frontal sinuses is as stated, ciliated. I cannot help suspecting, however, that it is not in all cases so. No amount of care has succeeded in the detection of ciliary epithelium in the ventricles of the brain. The epidermis of tritons and frogs consists of hexagonal, translucent, and adherent cells, containing distinct granular nuclei.

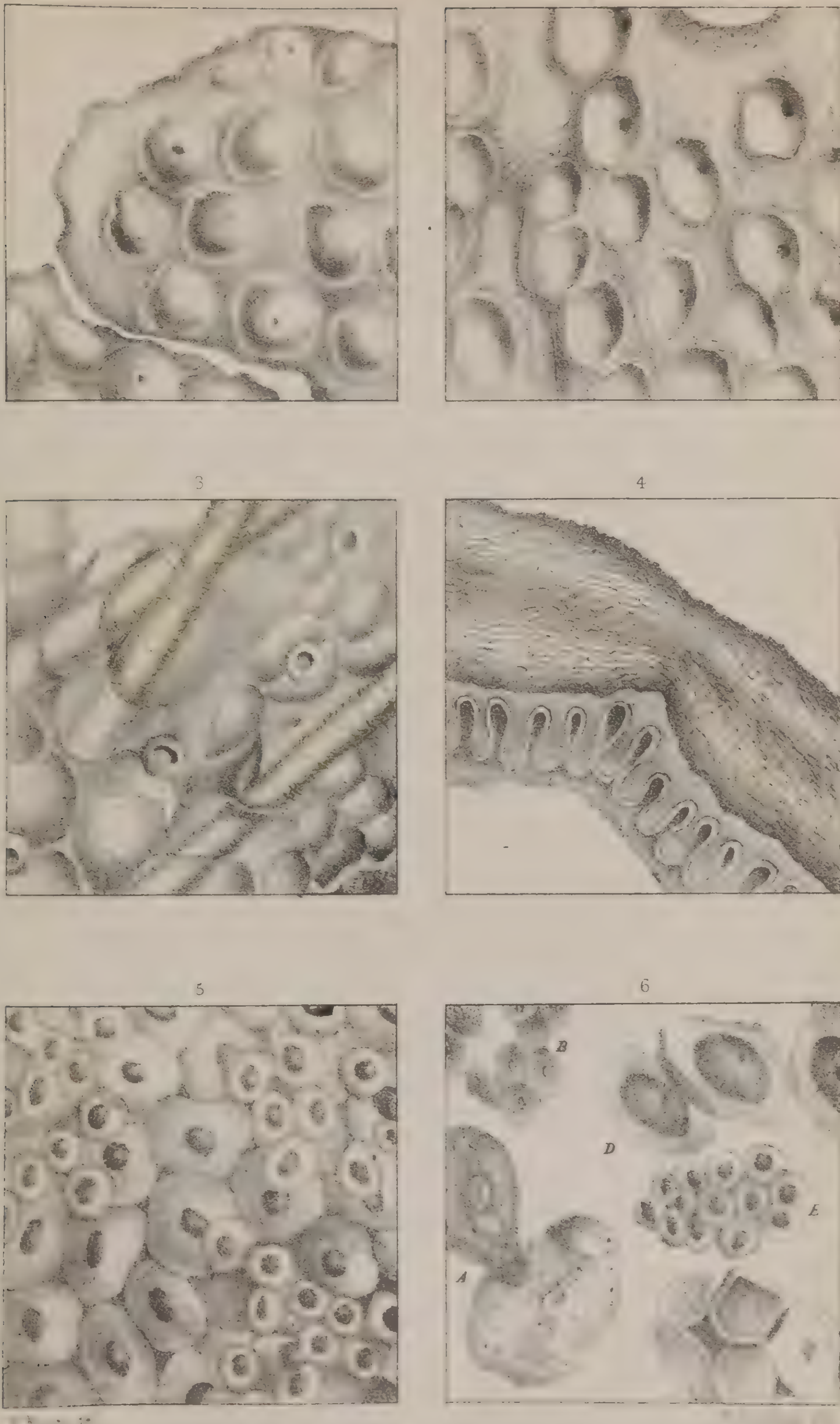
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PLATE XXVII.

PIGMENT CELLS.

Fig. 1. Pigment cells and granules taken from off the inner surface of the choroid membrane of the human eye, magnified 670 diameters.

Fig. 2. The pigment cells of the inner surface of the choroid of the eye of the pig, magnified 350 diameters.

Fig. 3, Displays the linear and branched disposition of the stelliform pigment cells of the *lamina fusca* of the eye of the pig- A similar disposition of these cells also exists in the human eye, but in light-coloured eyes is not strongly marked: the branches commence on the posterior part of the lamina, miscalled fusca, since in some instances it is jetty black, are at first thick and closely arranged; as they approach the anterior part of the eye, however, they diminish in size, and are separated by distinct intervals. This figure is magnified 100 diameters.

Fig. 4. A. Human stelliform pigment cells of the eye, magnified 350 diameters. B. Pigment cells of the skin of the negro, enlarged 670 diameters. C. Pigment cells from the lungs, magnified to the same extent.

Fig. 5. A portion of the epidermis of the negro, magnified 350 diameters, and, viewed on its under surface, the pigment cells are seen to be collected principally in the furrows which exist between the papillæ, the depressions produced by which are also represented in the figure,

Fig. 6. A portion of the epidermis removed from the areola around the nipple of a woman recently delivered, and also viewed upon its under surface. It is seen to differ solely from the epidermis of the negro in the smaller number of pigment cells contained in it. 350 diameters.

Obs. Pigment cells and granules frequently exist in the fibres of the external surface of the sclerotic of some animals, as the pig; and it is probable that in some instances they may be found in those of the eye of man.

Plate. XXVII

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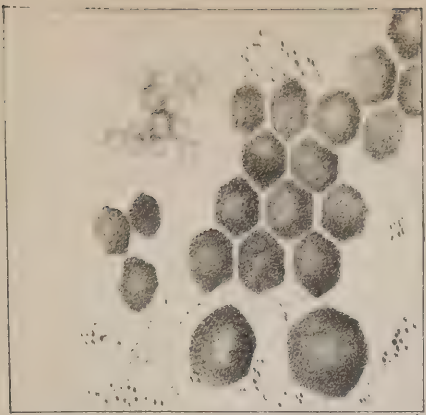

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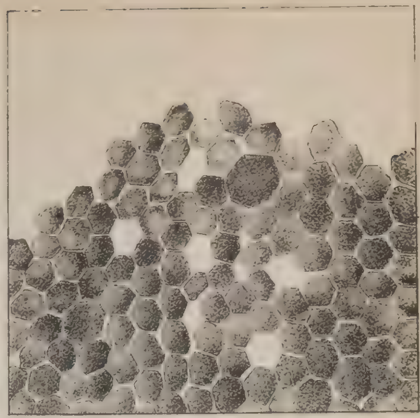

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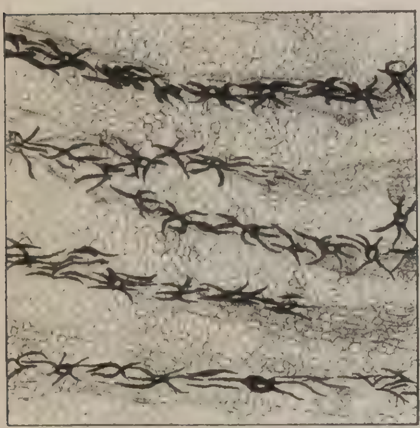

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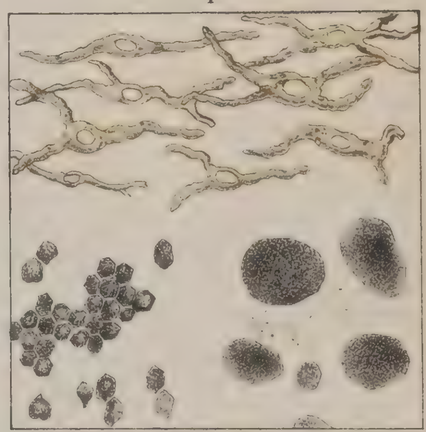

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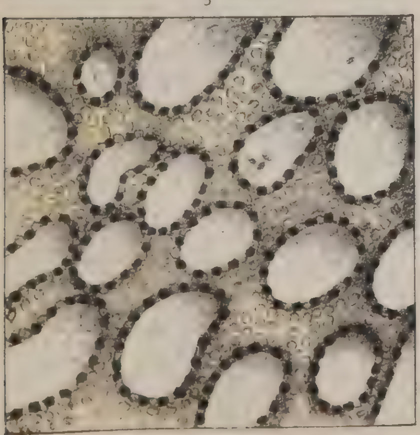

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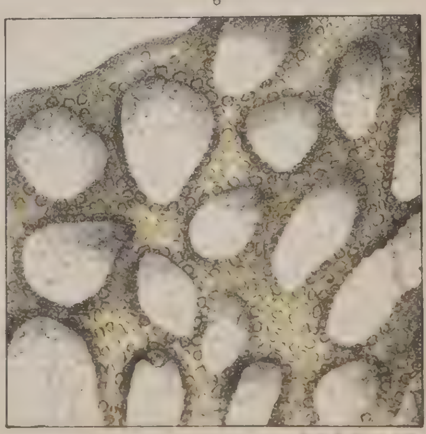

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PLATE XXVIII.

STRUCTURE OF HAIR.

Fig. 1, Shows the structure and depth of implantation of the entire root of a hair of the scalp, magnified 130 diameters: it displays the two sheaths which include the stem, and its dilated extremity, the bulb, and which is seen to rest upon a distinct cellular vesicle; the outer sheath completely surrounds the base of the hair, and cuts it off from all direct vascular supply; the vessels, however, which nourish the hair are seen to ramify on the external surface of this sheath, which is also observed to be surrounded by fat vesicles, the root having passed through the thickness of the skin, and imbedded itself in the sub-cutaneous and fatty cellular tissue.

Fig. 2. The root of a gray hair forcibly removed from the scalp; in this the outer sheath is seen to be broken off just above the place at which the stem begins to dilate into the bulb; a similar rupture almost invariably occurs in the outer sheath of all hairs, whether coloured or uncoloured, which are forcibly uprooted. The contrast between the coloured and the uncoloured hair is striking. 130 diameters.

Fig. 3. The cells of which the outer sheath is composed, magnified 670 diameters.

Fig. 4. A portion of the inner sheath, seen on its inner surface, and magnified 350 diameters; this is lined with a layer of elongated and nucleated cells; the outer portion of this sheath is distinctly fibrous, the fibres being formed out of the cells, the nuclei of which become absorbed: the inner surface also exhibits transverse markings, the impressions of the scales of the stem of the hair.

Fig. 5. Some of the pigment cells, of a multitude of which the bulb of the hair is composed: magnified 670 diameters.

Plate XXVIII

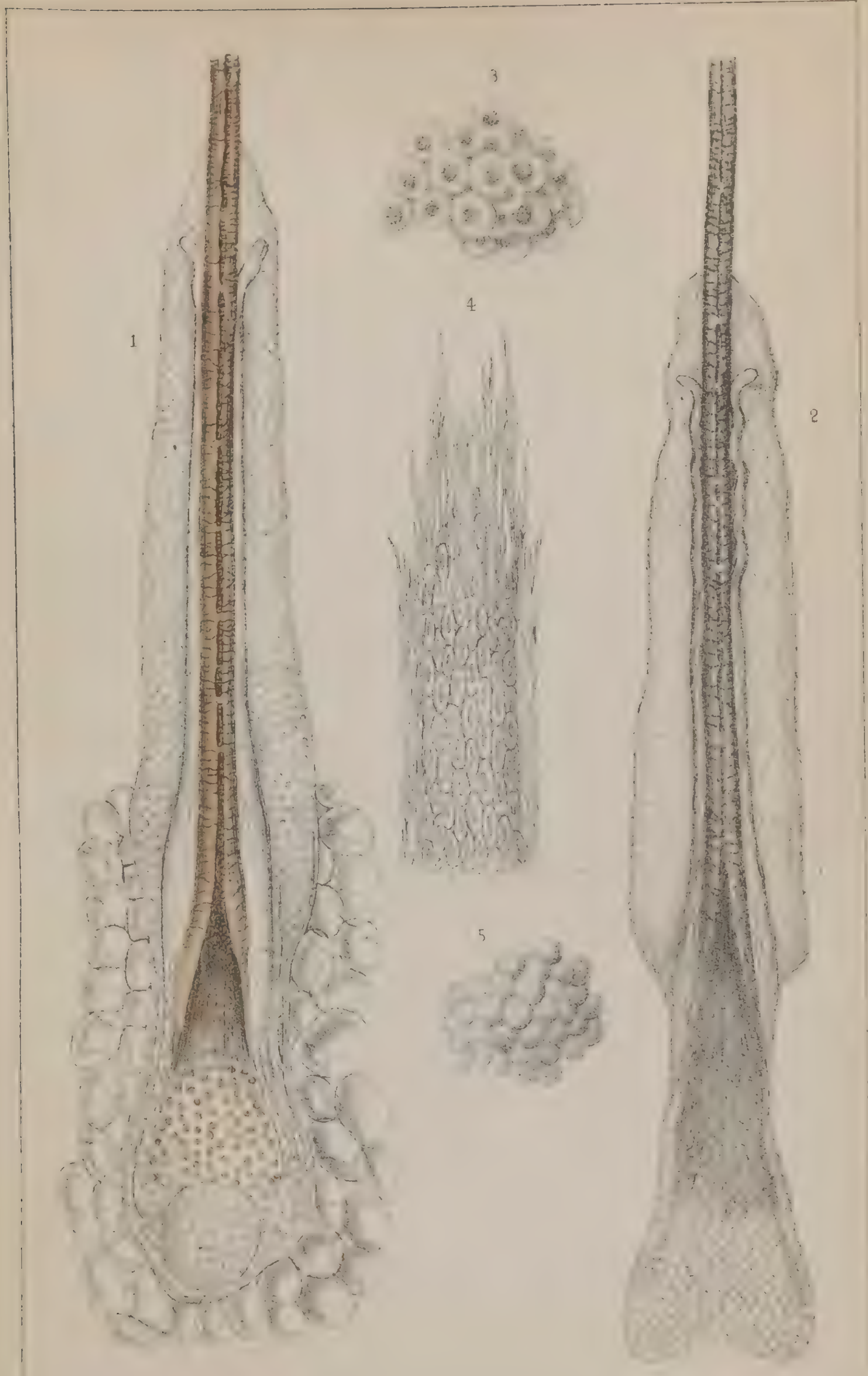

PLATE XXIX.

STRUCTURE OF HAIR.

Fig. 1. A portion of the stem of a gray hair of the scalp, magnified 350 diameters, showing the medullary canal, the fibres of the stem, and the outer imbricated scales.

Figs. 2, 3. Transverse sections of hairs of the beard: magnified 130 diameters.

Fig. 4. The fibres of the stem of a hair, magnified 670 diameters. It is most probable that these fibres originate in the same way as those of the inner sheath, viz: in nucleated cells.

Figs. 5, 6, 7. Apices of hairs: figs. 6 and 7 represent the points of two hairs of the scalp, magnified 350 diameters; and fig. 5 that of one of the perinæum. All hairs taken from this region, as well as those of the axilla, present similar obtuse extremities, which probably result from the constant friction to which they are subject in those situations.

Figs. 8, 9, represent the roots of two hairs of the scalp, removed with the comb; the sheaths, vesicle, and lower portion of the bulb having remained behind. All hairs removed with the comb and brush present the same appearances, that of fig. 8 being by far the most common form: magnified 130 diameters.

Fig. 10. A hair from the whisker, magnified 130 diameters, and containing two medullary canals.

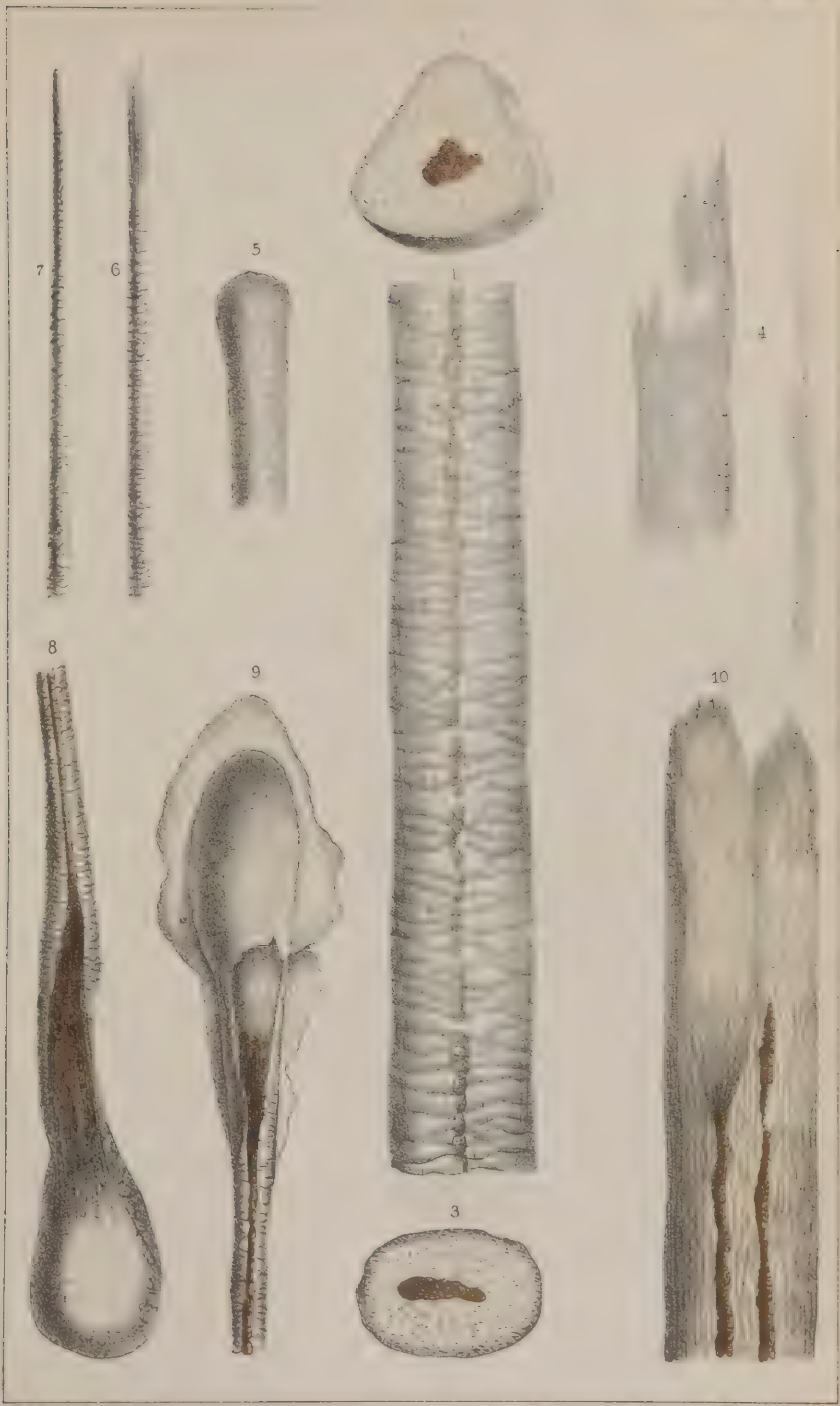
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PLATE XXX.

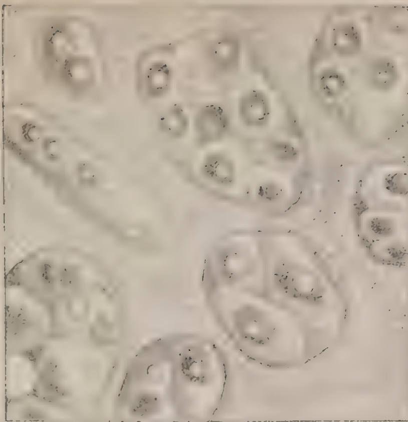
STRUCTURE OF CARTILAGE.

Fig. 1. A transverse section of the cartilage of a rib, magnified 350 diameters, showing the perichondrium and the compressed cells of the margin of the cartilage. It is most probable that it is in the space between the perichondrium and the external surface of the rib that the chief development of new cells takes place.

Fig. 2. A transverse section of the same, showing the parent cells, which are situated more deeply in the cartilage of the rib. 350 diameters.

Fig. 3. A vertical section of the articular cartilage of the head of the first phalanx of the second finger, including also a portion of the bone, the cancelli of which contain numerous bone cells, and the spaces between which are filled with fat vesicles: magnified 130 diameters.

Fig. 4. A vertical section of the outer part of an inter-vertebral cartilage, including a portion of the bone. But few corpuscles, and these for the most part calcified, occur in the outer part of these cartilages: the medullary cells of the bone are seen to be filled with fat vesicles, granular nucleated cells, and effused blood corpuscles. It sometimes happens that a layer of true articular cartilage is formed on the surface of the bone, and then the fibres of the fibro-cartilage take their origin from it, and not from the bone itself: 80 diameters.



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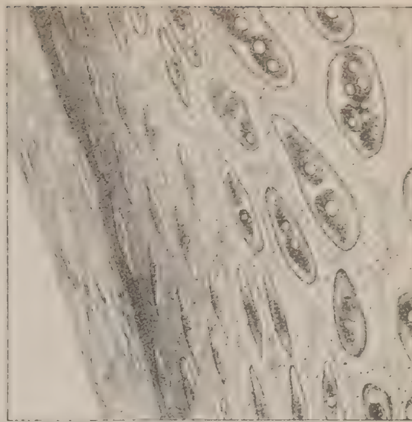

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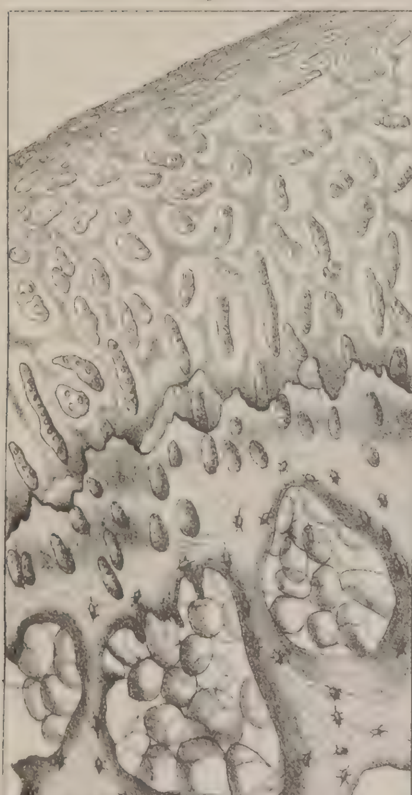

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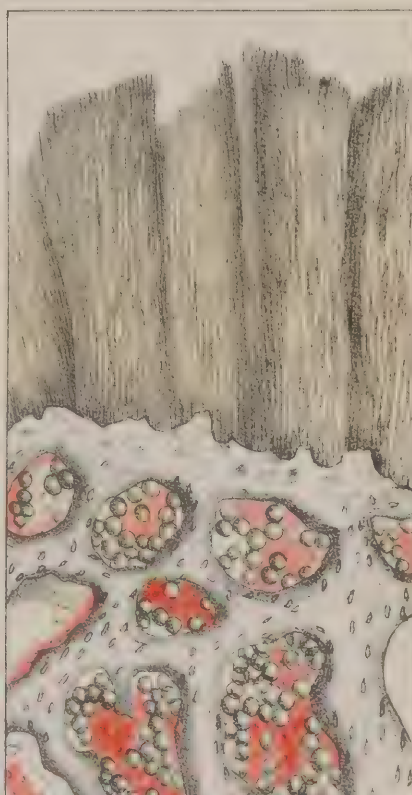

PLATE XXXI.

STRUCTURE OF CARTILAGE.

Fig. 1. A thin transverse section of the cartilage of the concha of the ear: magnified 350 diameters.

Fig. 2. The cells of the centre of an inter-vertebral cartilage in the different stages of their development. 350 diameters.

Fig. 3. A longitudinal section of the cartilage and bone of the rib of an adult, showing the mode of union between the two: magnified 130 diameters.

Fig. 4. A transverse section of one of the rings of the trachea; in these the cells are so closely aggregated that but little room is left between them for inter-cellular substance: 350 diameters.

Fig. 5. A transverse section of the thyroid cartilage of a young man, eighteen years of age, in which fibres analogous to those of the fibro-cartilages have made their appearance: 130 diameters.

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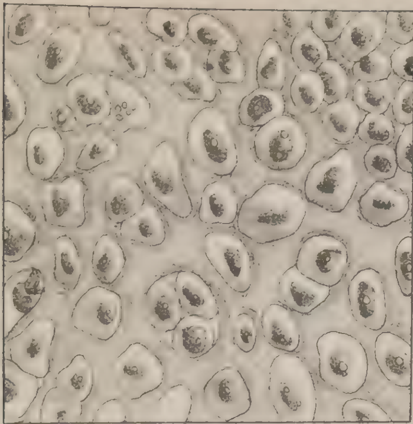

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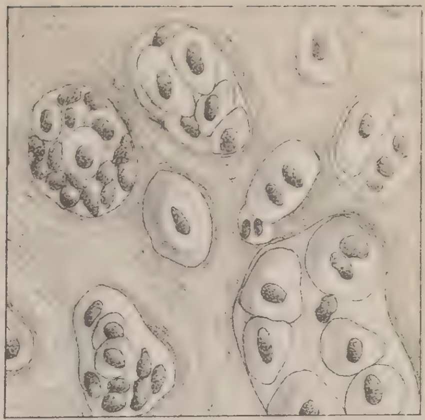

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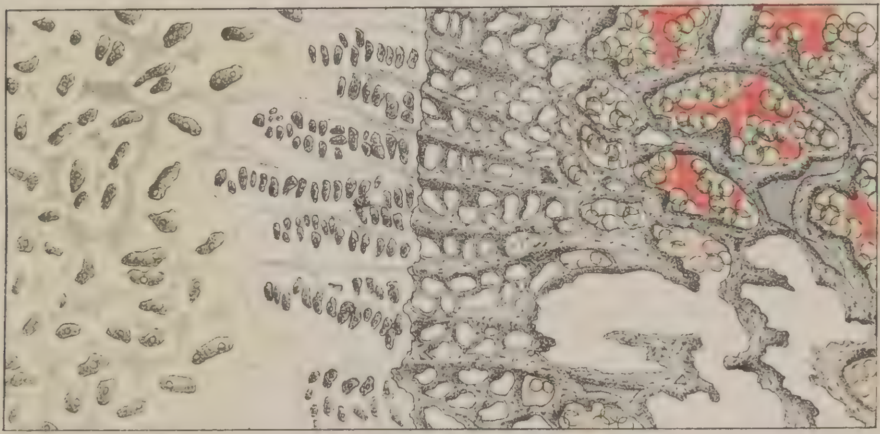

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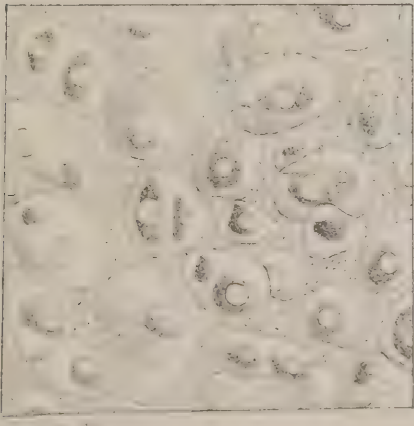

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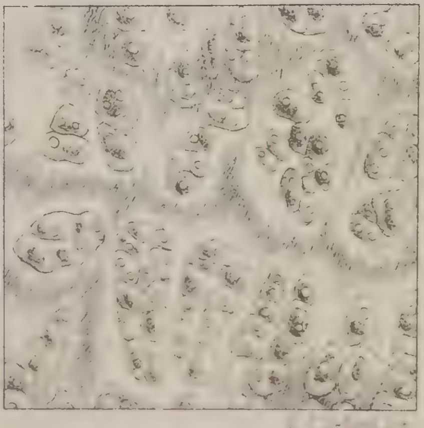

PLATE XXXII.

STRUCTURE OF BONE.

Fig. 1. A transverse section of ulna, magnified 60 diameters, showing the Haversian canals, the difference in the size of those situated on the outer and inner portions of the section, the systems of the lamellæ by which each canal is surrounded, and the bone cells placed between the lamellæ.

Fig. 2. Cross-section of Haversian canals, magnified 220 diameters, showing the lamellæ, and the bone cells with their anastamosing canaliculi more distinctly.

Fig. 3. The same, still more highly magnified, viz: 670 diameters.

Fig. 4. Longitudinal section of long bone, magnified about 40 diameters, showing the Haversian canals, seen lengthways, the direction of the lamellæ and the bone cells.

Plate XXXII

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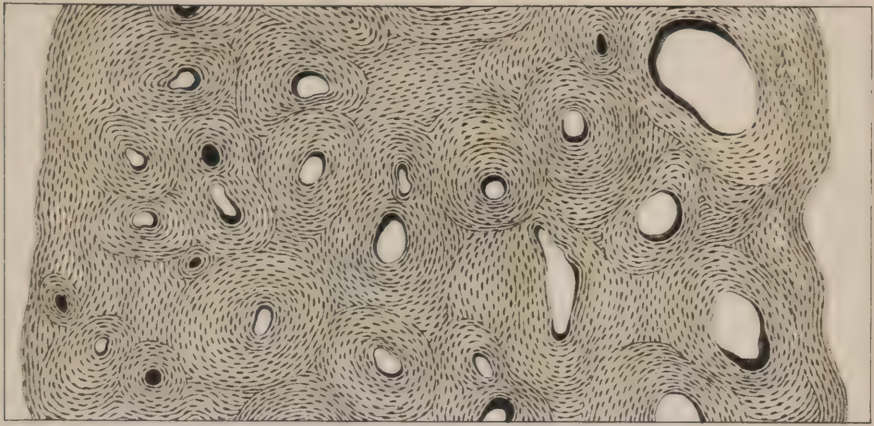

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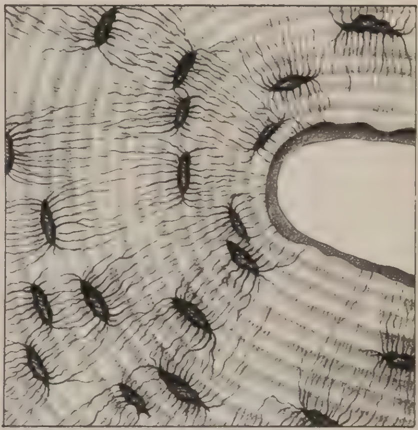

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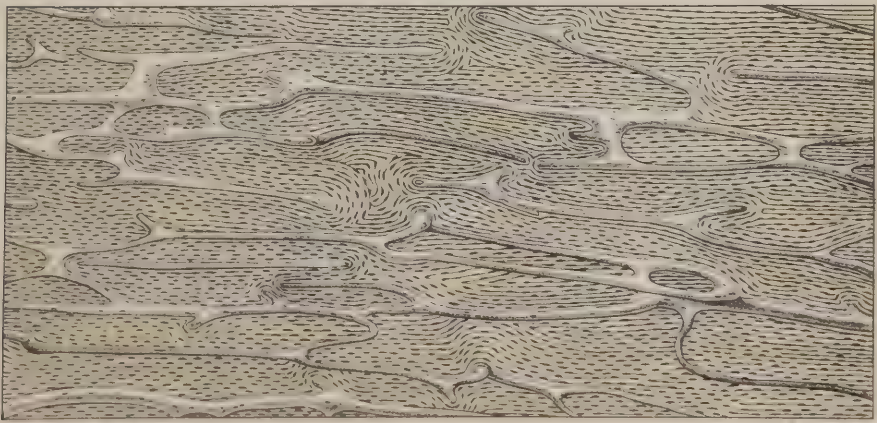

PLATE XXXIII.

STRUCTURE AND DEVELOPMENT OF BONE.

Fig. 1. Parietal bone of human fœtus, aged about two months, magnified 30 diameters.

Fig. 2. A portion of the same, magnified 60 diameters, showing the bone cells in process of development, some of which are seen lying loose in the spaces between the spicula, and which were destined, eventually, to become included in the ossific deposition.

Fig. 3. Spicula of bone of a fœtal humerus, showing the gradual deposition of the bony matter in the meshes of fibrous tissue, and altogether independently of cartilage, magnified 350 diameters.

Fig. 4. Lamina of a long bone, magnified 500 diameters, drawn from a preparation kindly placed at the author's disposal by Dr. Sharpey, by whom the structure figured was first described.

Fig. 5. Cancelli of one of the long bones of a human fœtus, magnified 350 diameters, showing the vast numbers of granular corpuscles which the medullary cells of bone of every age contain, but which are especially abundant in fœtal bones; the larger cells are magnified 750 diameters.

Fig. 6. Cross-section of the femur of a pigeon, fed for twenty-four hours upon madder. This drawing was made from a beautiful preparation belonging to Mr. Tomes, and lent me by that gentleman. Magnified 220 diameters.

Plate XXXIII

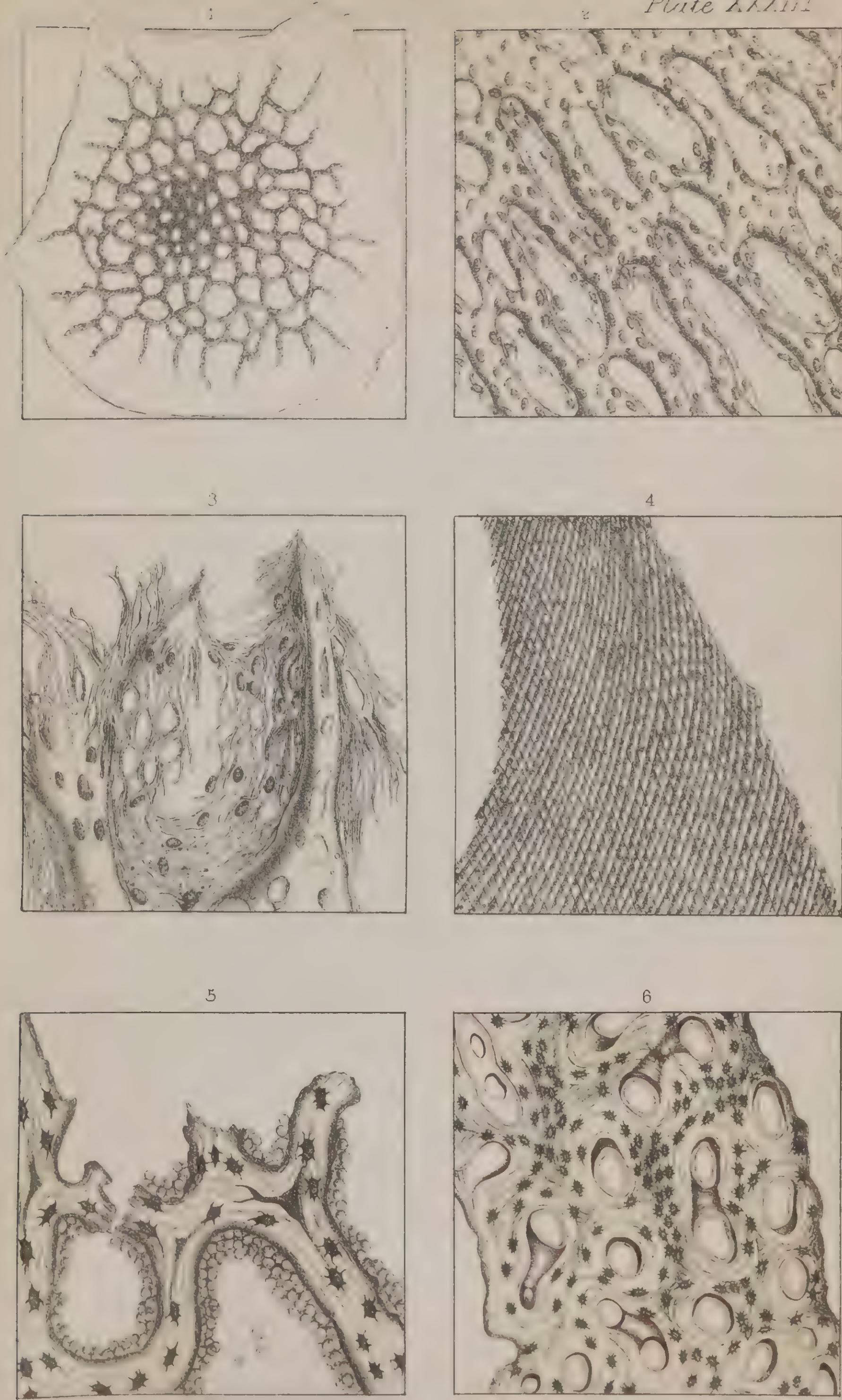

PLATE XXXIV.

DEVELOPMENT OF BONE.

Fig. 1. Longitudinal section of the epiphysis and a portion of the shaft of a fœtal femur at the ninth month, magnified 100 diameters, and showing the columnar arrangement of the cartilage cells, together with the increased size of the lower cells, and the invading spicula of the newly-formed bone.

Fig. 2. Transverse section of primary cancelli, magnified 350 diameters, showing the included nuclei of cartilage cells contained in the medullary cells or spaces.

Fig. 3. Transverse section of primary cancelli, magnified to the same extent as the last figure, in a more advanced stage of their formation, many of the first formed cancelli or septa having been absorbed, as well as the cell wall of the cartilage corpuscles themselves.

Fig. 4. Longitudinal section of the epiphysis and a portion of the shaft of a fœtal femur at the ninth month, magnified 350 diameters.

Plate XXXIV

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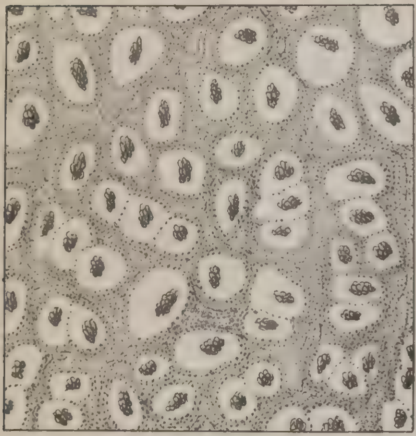

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PLATE XXXV.

DEVELOPMENT OF BONE.

Fig. 1. A transverse section of the cartilaginous epiphysis of the lower end of humerus, magnified 30 diameters, showing the apertures of the canals by which it is traversed.

Fig. 2. The same in connexion with the bone: in this figure it will be observed that there are fewer canals, that these are of larger calibre, and that the cartilage cells are disposed around them in a radiate manner in groups. 30 diameters.

Fig. 3. One of the apertures of the canal, more highly magnified, 330 diameters, showing more clearly the arrangement of the cells around it, the contents of the canal being granular corpuscles and blood-vessels, as well as the fact that the inter-cellular spaces nearest to the opening are the last to become converted into bone: in most of the medullary spaces of the second tier, the granular corpuscles have already made their appearance, the cartilage cells having been removed by absorption.

Fig. 4. The blood-vessels of the medullary cells of a young bone near the epiphysis injected. For the specimen from which this figure was drawn I am indebted to the kindness of Mr. Quekett, of the Royal College of Surgeons.

Fig. 5. Transverse section of the shaft of a fœtal long bone, displaying the fact that in fœtal bones there are no Haversian canals, such entirely consisting of medullary cells. 20 diameters.

Fig. 6. Transverse section of the rib of an adult, magnified 130 diameters, passing obliquely through the junction of the cartilage with the bone: in the upper part of the figure the cancelli are seen, including the terminal portions of the lowest tier of cartilage cells.

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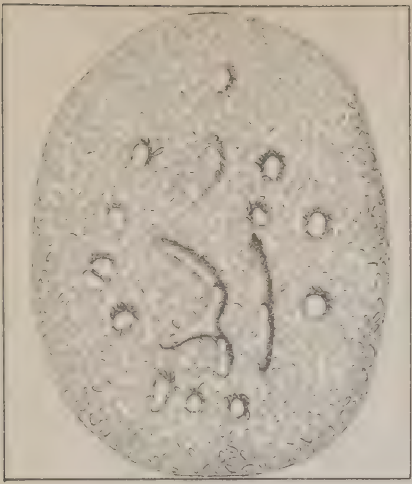

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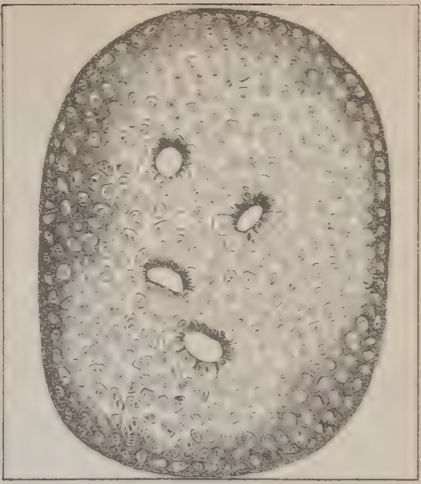

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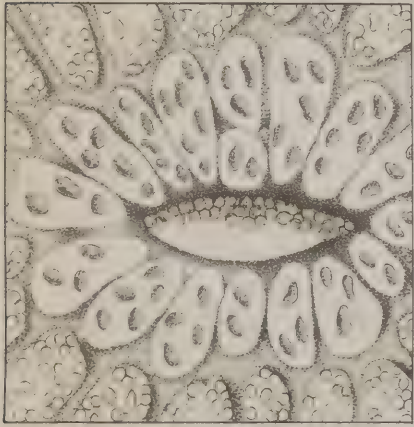

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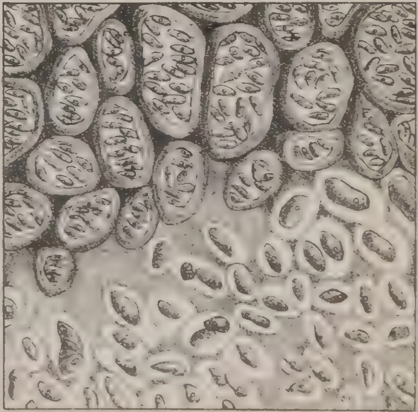

PLATE XXXVI.

STRUCTURE OF TEETH.

Fig. 1. Vertical section of incisor tooth, magnified with a lens only, and showing the three constituents of which every human tooth is composed, viz: superiorly, the enamel; inferiorly, the cementum; and in the centre, the dentine, traversed in the midst by the medullary cavity.

Fig. 2. Tubes of the dentine, showing their ordinary mode of termination in connexion with the cementum, magnified 670 diameters.

Fig. 3. A not unfrequent condition of the tubes of the dentine, showing their repeated division, and their connexion with bone cells near their termination. 670 diameters.

Fig. 4. Tubes of the dentine near their commencement from the pulp cavity seen lengthways: one of the tubes may be observed to divide in a diachotomous manner. 670 diameters.

Fig. 5. Oblique section of tubes of the dentine. 670 diameters.

Fig. 6. Transverse section of ditto. 670 diameters.

Fig. 7. Displays the breaking up of the tubes of the dentine into bone cells: this occurs principally near the terminations of those tubes which pass towards the cementum, and not of those which run towards the enamel: this condition does not present itself in every tooth. 670 diameters.

Fig. 8. Tubes of the dentine, midway between their origin and their termination, dilated into bone cells. 670 diameters. This figure is taken from a specimen kindly lent me by Mr. Tomes.

Plate XXXVI

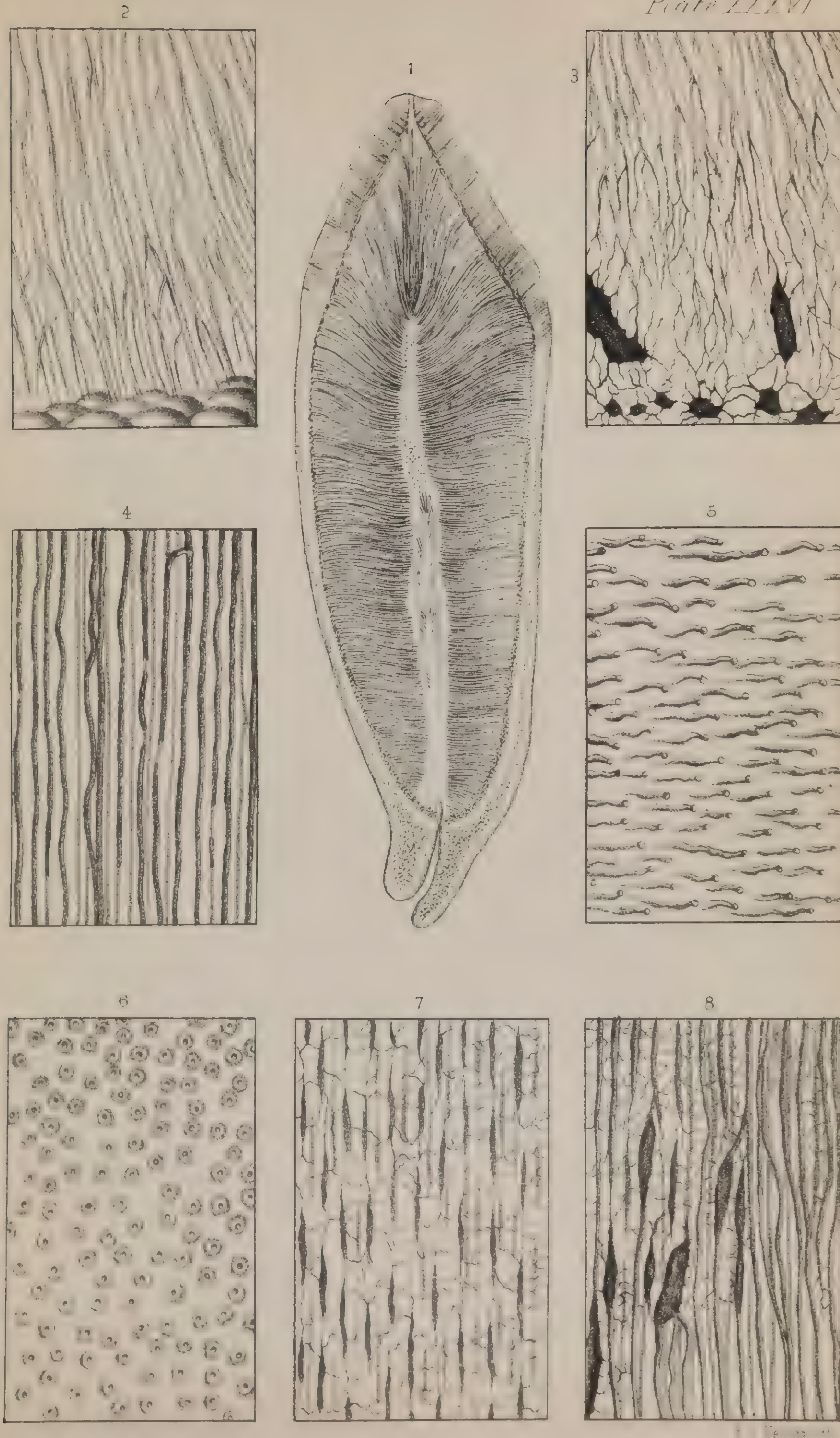

PLATE XXXVII.

STRUCTURE OF TEETH.

Fig. 1. Section of cementum, magnified 670 diameters; internally, but really near the outer margin of the cementum, some imperfectly developed bone cells may be observed, each surrounded by a clear space, having some resemblance to a cell wall; externally, and bordering upon the dentine, a closely aggregated layer of still more imperfectly formed bone cells are seen.

Fig. 2. Section of same traversed by tubes, continuations of those of the dentine. 670 diameters.

Fig. 3. Section of cementum, showing a number of small angular cells, and which may frequently be observed in that portion of the cementum which lies near to the dentine. 670 diameters.

Fig. 4. Oblique section of healthy dentine, over the surface of which a fungus has developed itself. It is no uncommon circumstance to meet with sections thus completely invested with a similar fungus; I have seen several such. 670 diameters.

Fig. 5. Oblique section of dentine, in which numerous bright globules, having a resemblance to oil globules, are observed to be present. 350 diameters.

Fig. 6. Section of secondary dentine, and which also contains Haversian canals. This drawing was made from a preparation belonging to Mr. Tomes. 350 diameters.

Fig. 7. Transverse section of bicuspid tooth, showing the presence of an Haversian canal in the cementum, magnified with a lens only. This drawing has also been made from an interesting preparation, the property of Mr Tomes.

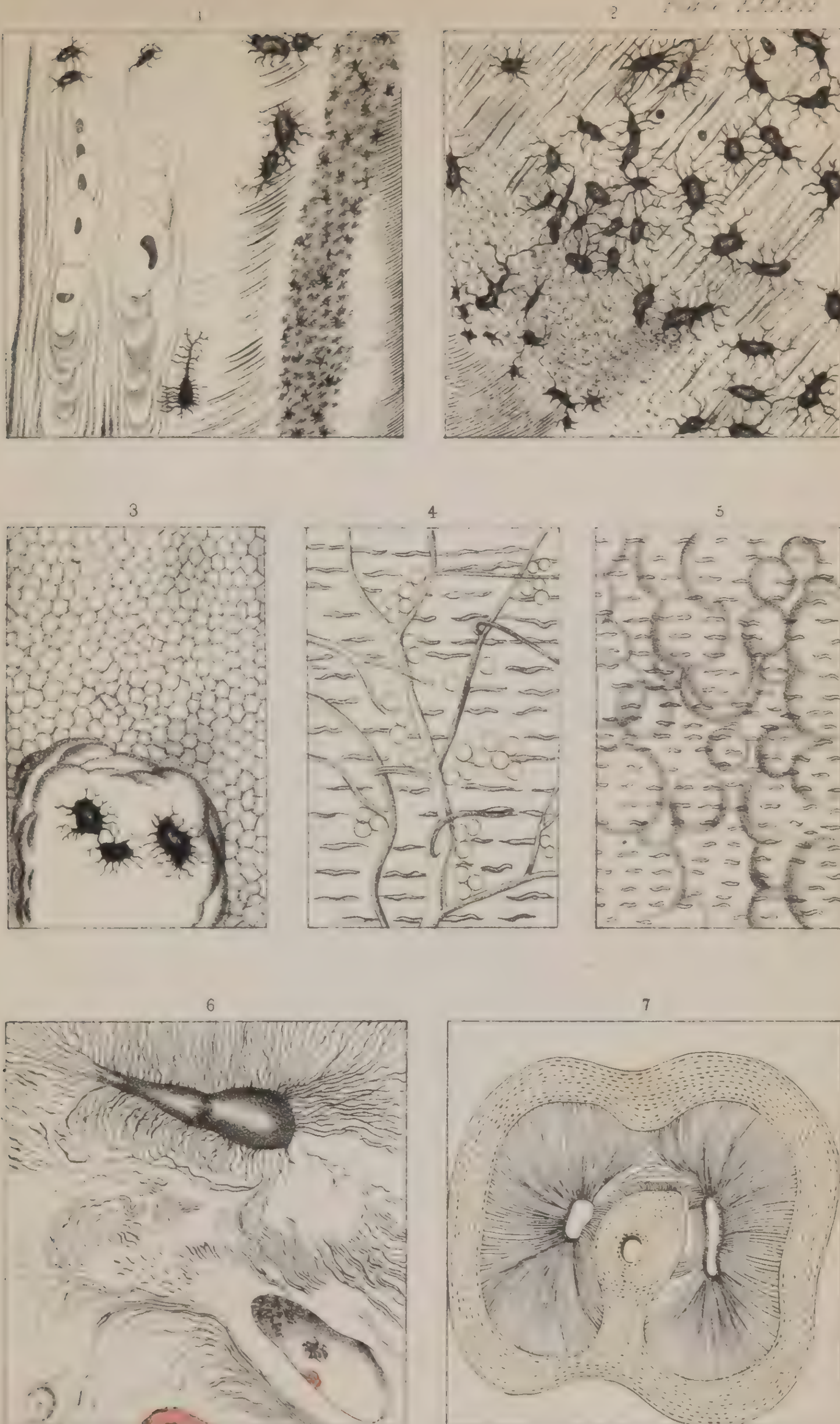

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PLATE XXXIX.

STRUCTURE OF TENDONS, TEETH, AND FIBROUS TISSUE.

Fig. 1. Longitudinal section of a tendon, showing the presence in it of nucleated fibres of elastic tissue; these are best seen after the application of acetic acid, but may be clearly recognised without the employment of that rëagent. 670 diameters.

Fig. 2. Transverse section of same, from which it becomes evident that the fibres are branched. 670 diameters.

Fig. 3. Vertical section of enamel, magnified 220 diameters. The enamel cells thus lowly magnified give the section a fibrous appearance.

Fig. 4. A portion of enamel, magnified 670 diameters, and showing the enamel cells still more clearly.

Fig. 5. Transverse section of enamel, showing the hexagonal form of the enamel cells. 670 diameters.

Fig. 6. Inëlastic fibrous tissue, magnified 670 diameters.

Fig. 7. Mixed fibrous tissue: the threads of the elastic fibrous tissue may be recognised by their tortuous course and more defined outline. 670 diameters.

Plate XXXIX.

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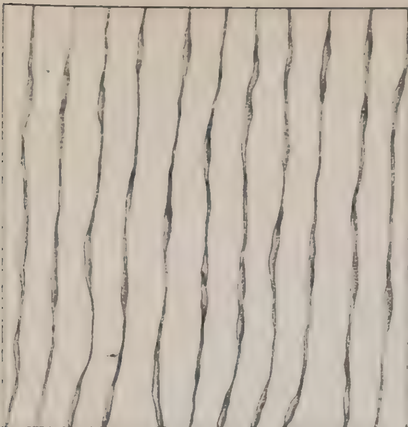

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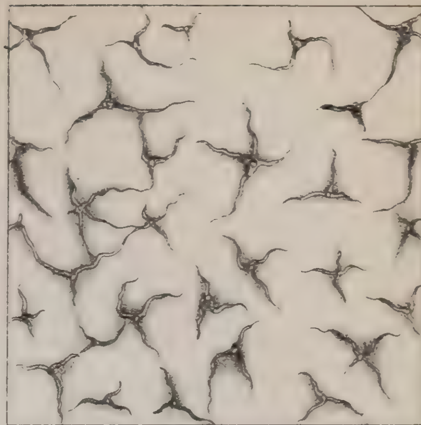

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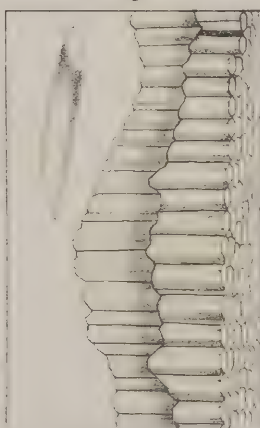

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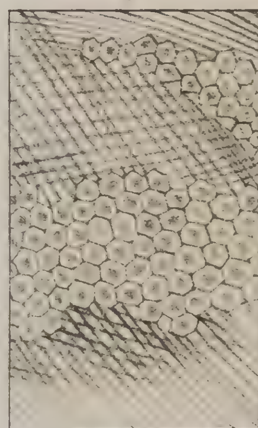

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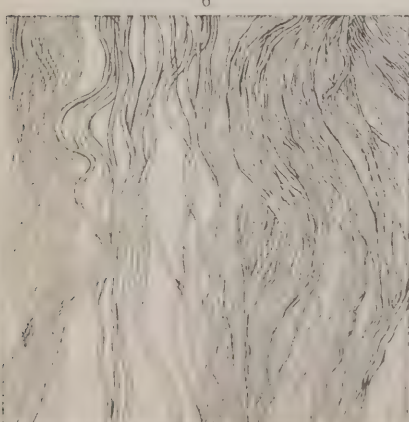

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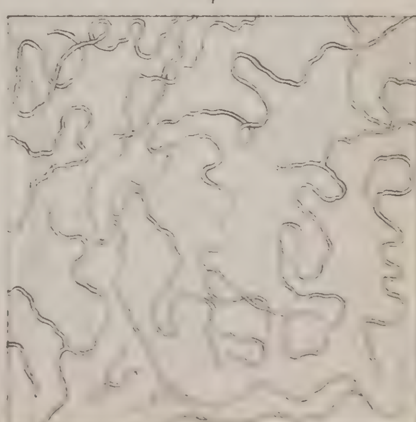

PLATE XL.

STRUCTURE OF FIBROUS TISSUE.

Fig. 1. Example of elastic fibrous tissue in its ordinary form, taken from the crico-thyroid membrane, and magnified 670 diameters.

Fig. 2. Form of elastic tissue, constituting the elastic coat of many blood-vessels of medium calibre. 670 diameters.

Fig. 3. This figure illustrates various stages in the development of blood-vessels. At first, a transparent and tubular membrane is surrounded by a single coil of elastic tissue; subsequently, other coils and filaments appear, the filaments principally take a longitudinal direction on the tubular membrane, but some also pass circularly around this; these threads are nucleated, and belong to the second form of elastic tissue, and which is elsewhere encountered in the human organization, as in tendons, the dartos, &c. 350 diameters. In *h* the threads are shown separately.

Fig. 4. A peculiar areolar form of mixed fibrous tissue, magnified 130 diameters, and principally encountered in the great omentum.

Fig. 5. Blood-vessels from the pia mater. All the smaller vessels present a similar structure, their coats being formed of nucleated filaments of elastic tissue. 350 diameters.

Plate XI

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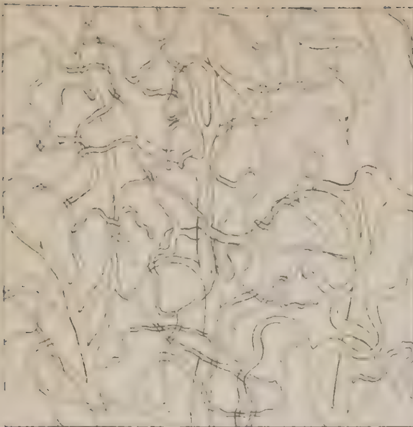

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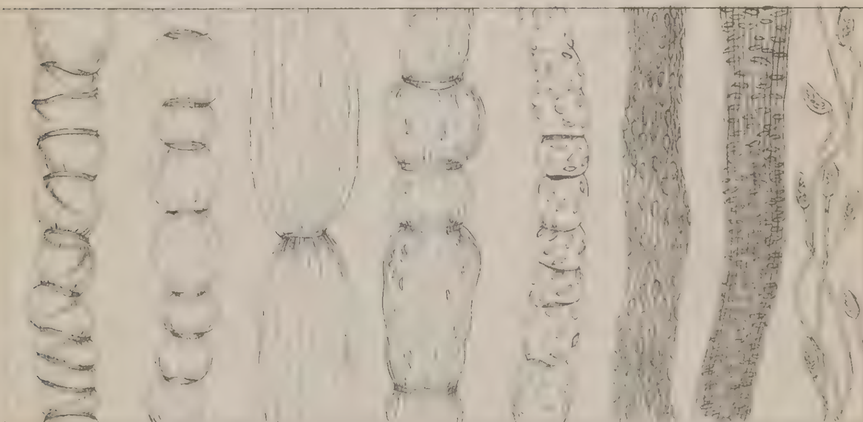

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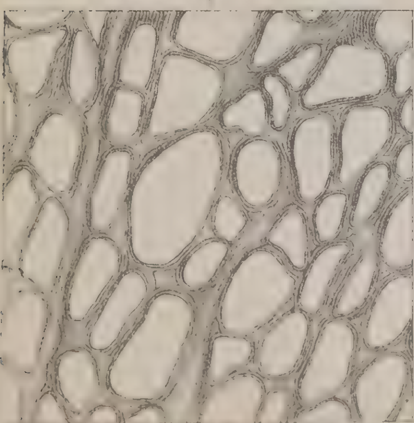

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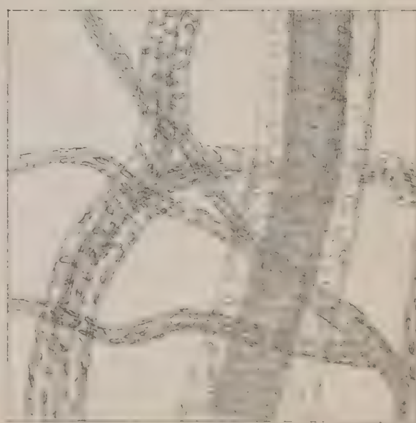

PLATE XLI.

STRUCTURE OF MUSCLE.

Fig. 1. A portion of the surface of a striped muscle, magnified about 60 diameters, showing the distribution of the blood-vessels and fat globules.

Fig. 2. A fragment of unstriped muscle; the fibres, with their nuclei, in one-half of the figure are less distinct than in the other, the filaments in the second half having been submitted to the action of acetic acid. 670 diameters.

Fig. 3. Muscular fibrillæ of the heart; previous to the action of acetic acid, they are observed to be transversely striped; this rëagent, however, obliterates the stripes, and reduces the fibrillæ to the same condition as those of unstriped muscle. 670 diameters.

Fig. 4. A fragment of the muscle of the frog, showing the distribution of the capillary vessels and nerves; the tubules of these last are observed to terminate in ganglion-like bodies situated between the muscular fibrillæ. 350 diameters.

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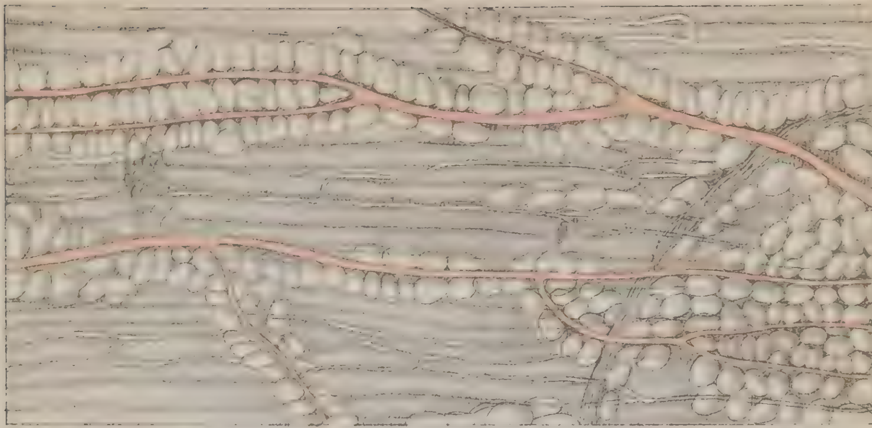

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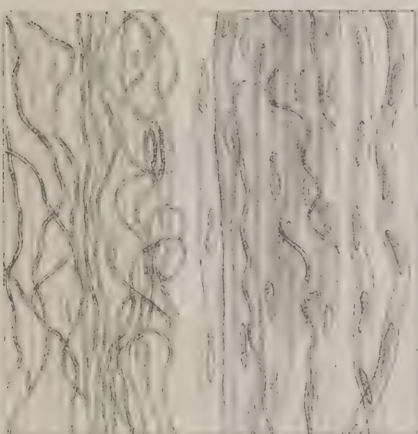

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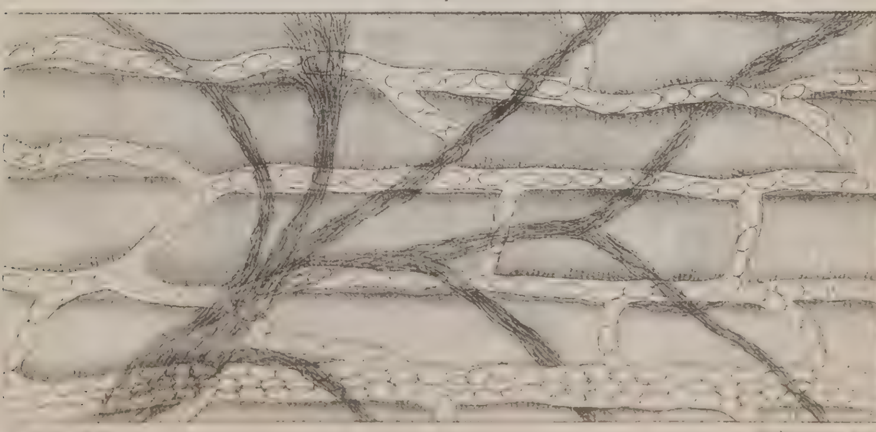

PLATE XLII.

STRUCTURE OF MUSCLE.

Fig. 1. Muscular fibres and fibrillæ of a voluntary muscle; in one of the fibres the fibrillæ have given way, thus allowing the sarcolemma to become apparent. This figure, as well as most of the remaining figures on this plate, are all magnified about 350 diameters.

Fig. 2. Voluntary muscular fibres acted upon by acetic acid, which brings clearly into view a number of granular nuclei; these nuclei are contained in the fibrillæ, many of which are unstriped, and two of which are represented in the figure separately. 350 diameters.

Fig. 3. This figure represents particulars in reference to muscular contraction; in *a*, a fibre is shown which has been placed upon the stretch, the striæ in it are observed to be somewhat distant. *b* represents the same fibre in a state of normal and ordinary contraction; the diameter of the fibre is seen to be much greater and the striæ closer. *c*, the torn extremity of a fibre immersed in water prior to the total extinction of its irritability, and which is observed to be very greatly contracted; the difference of distance between the striæ in the contracted and uncontracted portions of the fibre is very remarkable. *d*, a fibre which still retained its irritability immersed in water; this has caused the fibre to curl up, to become irregular and undulated; the transverse striæ have disappeared, the longitudinal markings at the same time being more apparent; in *e* the extremity only of the fibre has been immersed in water.

Fig. 4. Shows the great variety in the size of the fibres of a muscle, the form of the extremities of the fibres, and the mode of union between these and the tendon. 130 diameters.

Fig. 5. Transverse section of muscular fibres and intervening capillaries. 350 diameters.

Plate XLII

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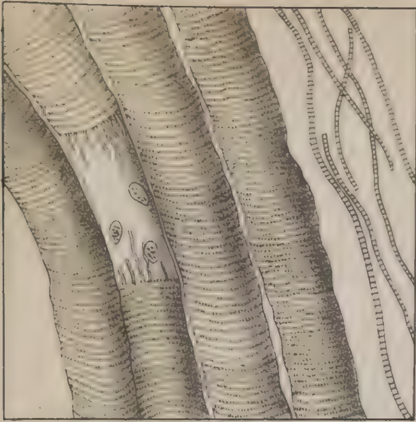

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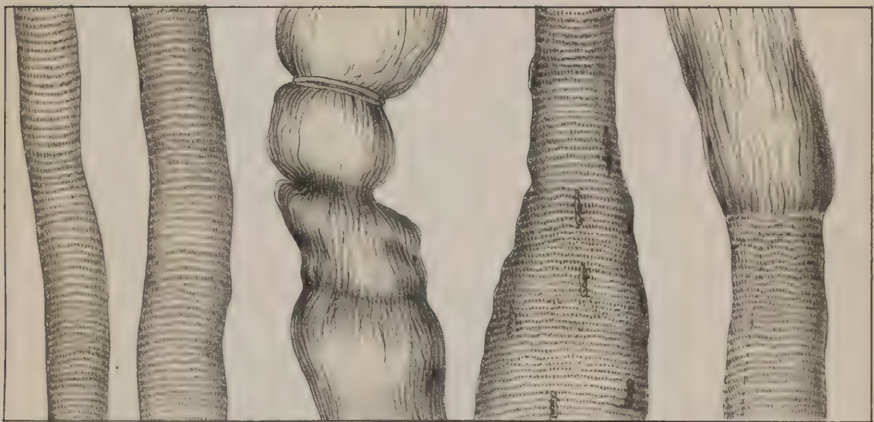

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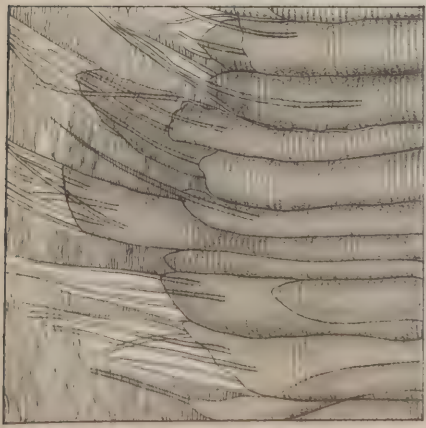

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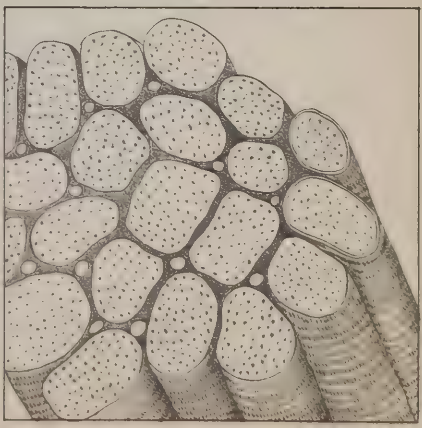


E. C. Kellogg lith

PLATE XLIII.

Fig. 1. A portion of a voluntary muscle of a fœtus about three months old, magnified 670 diameters, presenting numerous nuclei, some of which are imbedded *in* the fibres, and others lie *between* them. At this early period the fibres are formed of but few fibrillæ. The small size of these fibres in comparison with those of the adult, and which are represented in fig. 6, is worthy of note. 670 diameters.

Fig. 2. Illustrates the development of the inelastic form of fibrous tissue from nucleated and granular cells. This figure was also taken from a fœtus at about the third month. 670 diameters.

Fig. 3. A portion of dartos, magnified 350 diameters, showing the different structures which enter into its composition, viz: the blood-vessels, the bands of elastic fibrous tissue, and lastly, the bundles of inelastic fibrous tissue.

Fig. 4. A transverse section of a portion of one of the corpora cavernosa penis, showing the apertures of the vessels or cells of which they are principally composed, as well as the walls of those cells which are formed, not of nucleated elastic tissue, but of branched and reticular elastic filaments. This figure is magnified only a few diameters.

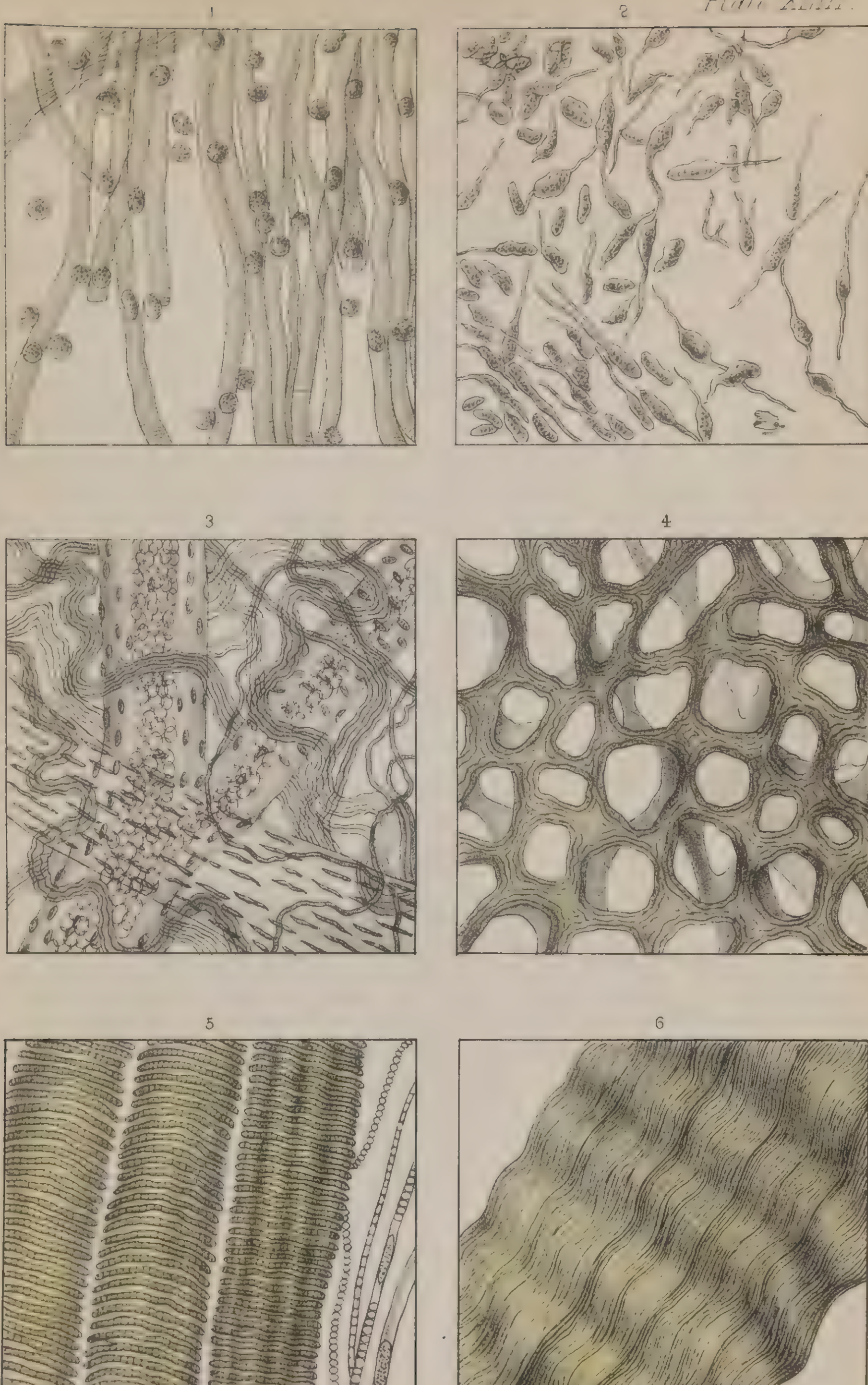
Fig. 5. Muscular fibres of voluntary muscle, disposed in a zigzag manner; this disposition was formerly considered to be normal, and to be that assumed by the fibres of every muscle in a state of contraction, a view which is certainly erroneous; it is encountered in a greater or less degree in all fried and roasted meats. 350 diameters.

Fig. 6. Striped muscular fibres, magnified 670 diameters. It will be seen from the figure, that the surface of each fibre is raised

into ridges with a narrow space intervening between each ridge, and further, that the ridges are marked out into quadrangular spaces, each of which corresponds with a division of the fibrillæ themselves. Now, this form of the surface of a striped fibre is especially interesting, from the fact of its enabling us to afford a satisfactory explanation of the nature of the striæ themselves. The most recent explanation given of the formation of the striæ of the voluntary muscular fibre, and which has been generally adopted, is, that it depends upon the circumstance that the lines on the fibrillæ are placed so as exactly to correspond with each other, and that thus a number of smaller lines concur to form a larger one, the stria of the entire fibre. Such an exact arrangement of the lines on the fibrillæ there is little doubt does really exist, but it is yet insufficient to explain all the characters presented by the muscular striæ. Thus, although the striæ are usually strongly marked and broad, yet they have no certain characteristics, either as to position or appearance. In what way then is the muscular stria produced? A careful examination of a recent muscular fibre, with an object-glass of the one-eighth of an inch focus, will satisfy the observer that the muscular stria is not a thing of shape and substance itself, but a mere shadow, caused by the ridges into which the surface of the fibre is raised, and which sometimes falls on one side the ridge, sometimes on the other, and frequently in the groove which runs between the ridges, according to the direction of the light, and the focus in which the object is viewed. Of the correctness of this explanation it does not appear to me that there can be a shadow of doubt.

See Appendix to vol. i., page 547.

Plate XLIII.



H Miller, del

F C Kellogg lith

PLATE XLIV.

STRUCTURE OF NERVES.

Fig. 1. Tubes of a motor nerve. The space between the two lines on each margin indicates the thickness of the white substance of Schwann. The waved tube represents the appearance presented by the nervous tubules, when separated from each other in water. 670 diameters.

Fig. 2. The same in spirit, showing the nucleated threads of which the neurilemma is made up. 670 diameters.

Fig. 3. The same in acetic acid, which breaks up the semi-fluid contents of the tubes into globules resembling those of oil. 670 diameters.

Fig. 4. Portions of Casserian ganglia, magnified 350 diameters. In one of the figures, the ganglion corpuscles are naked; in the other, they are invested with a nucleated capsule.

Fig. 5. Nerve tubes of the white substance of the cerebellum, mixed up with the clear cells described in the text as forming a considerable portion of the white substance of the cerebrum, cerebellum, spinal marrow, and nerves of special sense. 670 diameters.

Fig. 6. Nerve tubes of the white substance of one of the hemispheres of the cerebrum, mixed up with the peculiar cells already referred to. 670 diameters.

Fig. 7. Tubes of the cerebrum in a varicose condition. 670 diameters.

Plate XLIV

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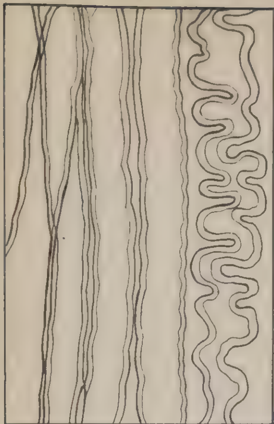

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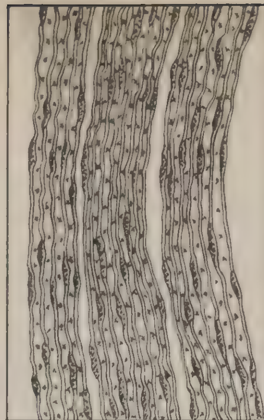

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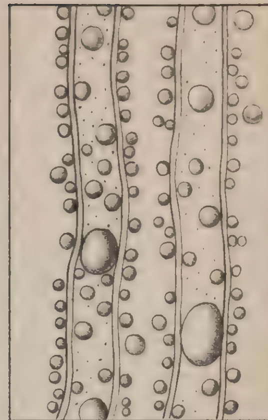

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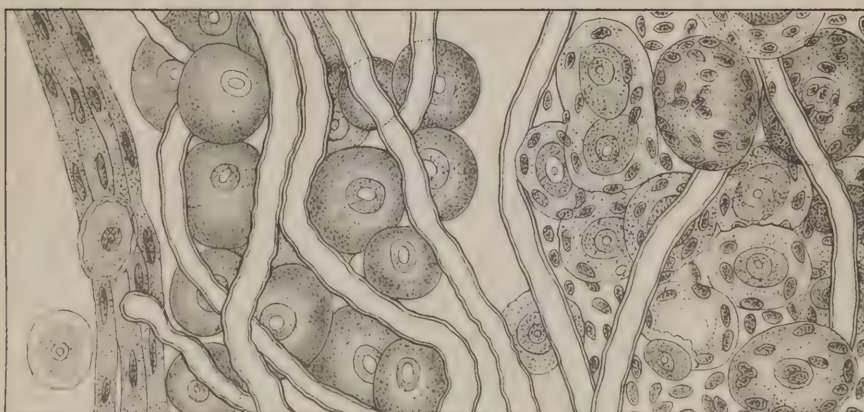

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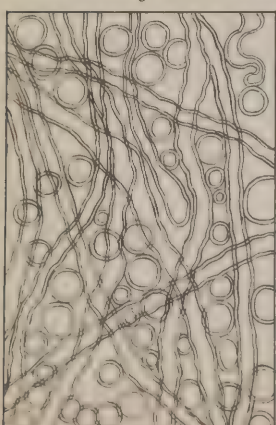

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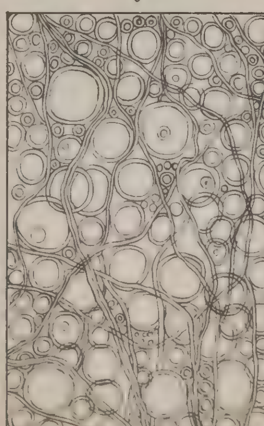

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E. C. Kellogg lith

PLATE XLV.

The majority of the figures in the following Plates were made with the assistance of the Camera Lucida, and the same instrument will be employed in the delineation of all future figures wherever practicable.

Fig. 1. Filaments of the great sympathetic, magnified 670 diameters.

Fig. 2. Cells of the gray matter of the cerebellum, outer stratum. 670 diameters.

Fig. 3. Ditto, inner stratum. 670 diameters.

Fig. 4. Caudate ganglionary cells from the gray matter of the spinal cord, medulla oblongata, and cerebellum; magnified 350 diameters. Those from the first locality are distinguished from the rest by their larger size; those from the second situation by their smallness and elongated form, and the cells from the cerebellum by their intermediate size and flask shape.

Fig. 5. Caudate ganglionary cells from the locus niger of the crus cerebelli. 350 diameters.

Fig. 6. Minute caudate cells from the hippocampus major. 350 diameters.

Fig. 7. Ditto, from the locus niger of crus cerebri. 350 diameters.

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Plate LV

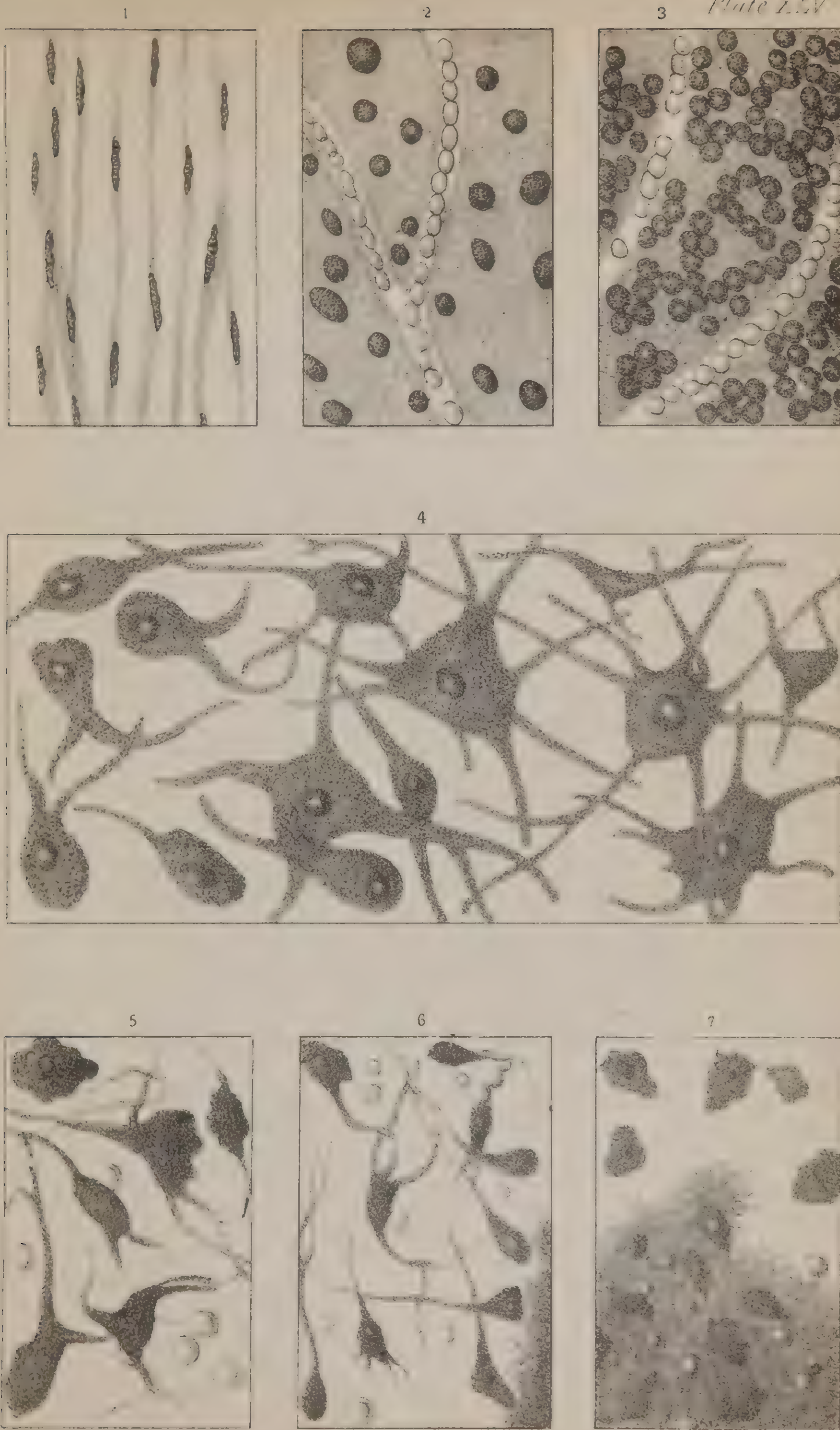


PLATE XLVI.

Fig. 1. Pacinian corpuscles attached to the cutaneous nerves of the palm of the hand. Natural size. After Todd and Bowman.

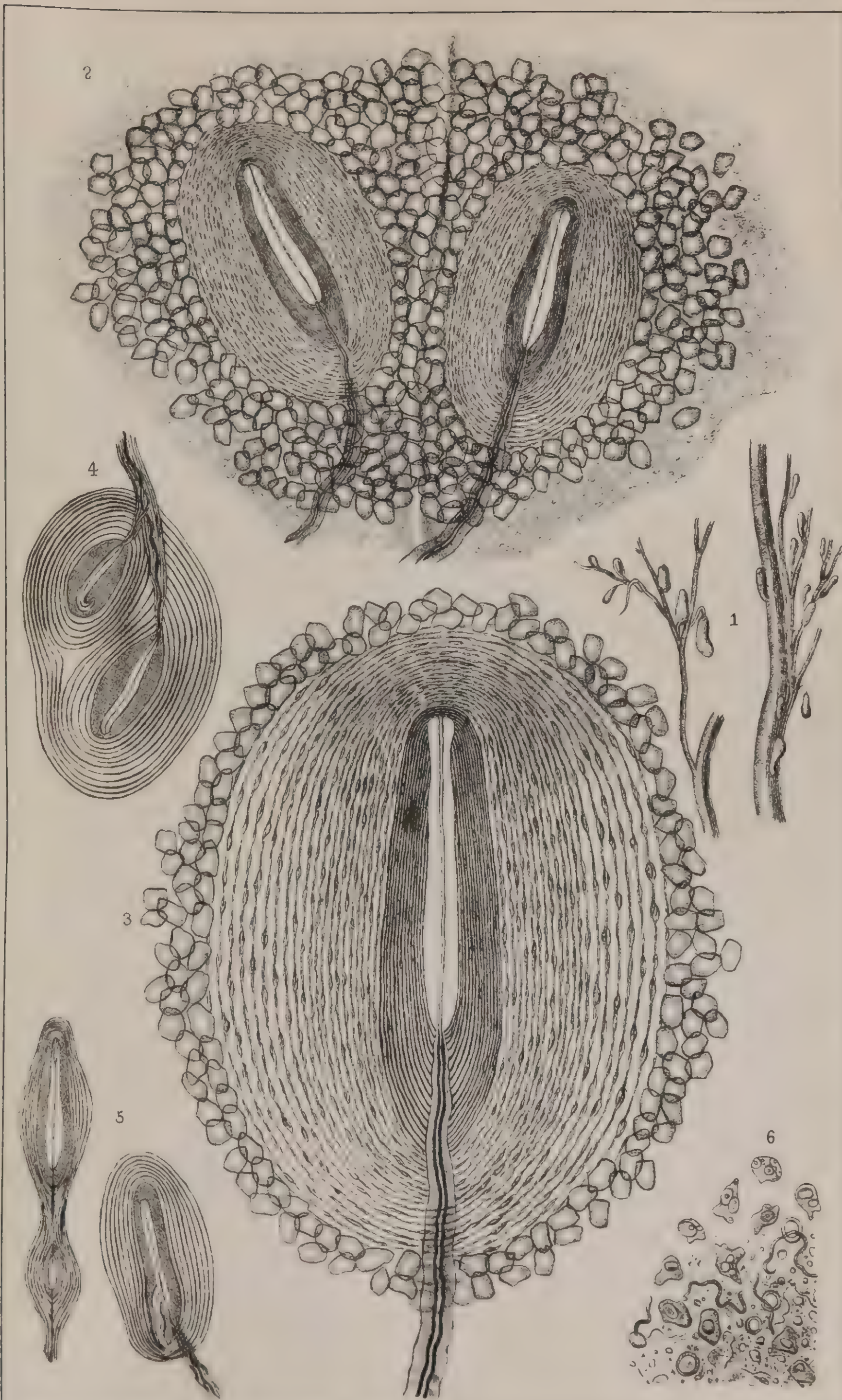
Fig. 2. Pacinian corpuscles, magnified 60 diameters.

Fig. 3. A single Pacinian body, more highly magnified, viz: 100 diameters.

Fig. 4. An anomalous Pacinian body from the mesentery of the cat. After Todd and Bowman.

Fig. 5. Two other anomalous Pacinian bodies from the same animal. The latter, reduced from Henle and Kölliker.

Fig. 6. Ganglionary cells from the corpus dentatum of the cerebellum. 350 diameters.



E C Kellogg lith

PLATE XLVII.

Fig. 1. The pleural surface of a portion of lung, magnified 30 diameters. This figure conveys an accurate idea of the form and great abundance of the air cells.

Fig. 2. Pleural surface of a section of lung, showing the distribution of the vessels of the first of the three orders of sizes mentioned in the text. 30 diameters.

Fig. 3. Ditto of lung, magnified 100 diameters. The vessels in this are not injected, but are represented as they appeared in a section which had become slightly dried.

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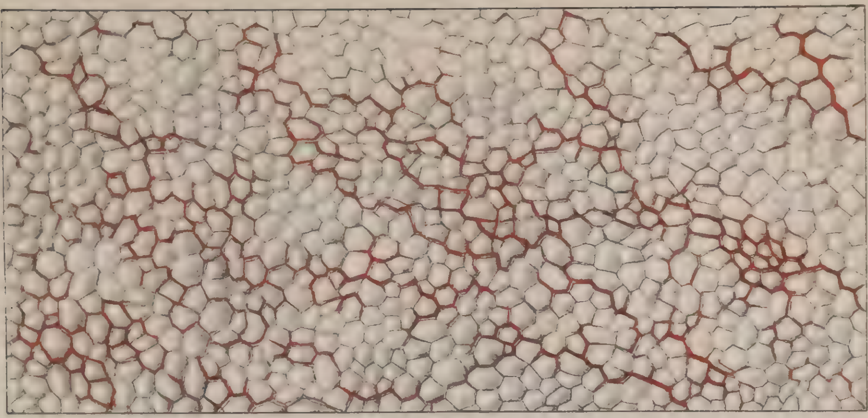

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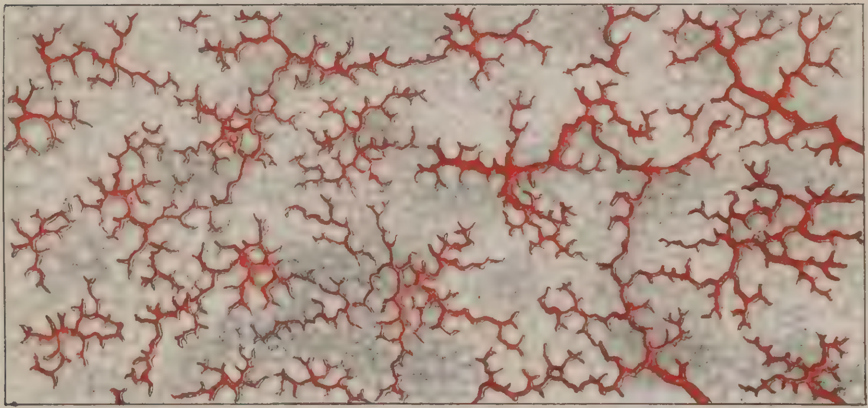

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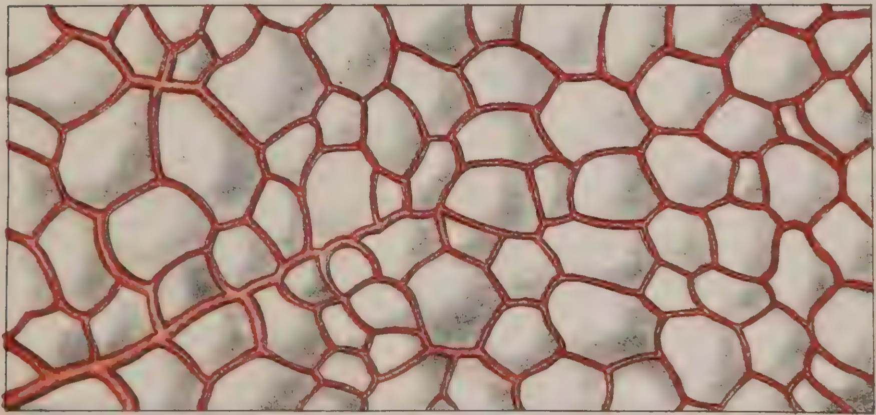

K C Kellogg lith

PLATE XLVIII.

Fig. 1. A section of lung from beneath the pleural surface, magnified 100 diameters, injected with tallow.

Fig. 2. Casts or models of the air cells, magnified 350 diameters, representing the variety in size and form of these cells, as well as the shape and number of the openings of communication.

Fig. 3. Deep section of lung, injected with size: the majority of the cells are observed to be filled with the casts tipped with colouring matter: other cells may also be seen without casts: these have evidently been cut across, exposing to view the ciliated epithelium which lines them. 100 diameters.

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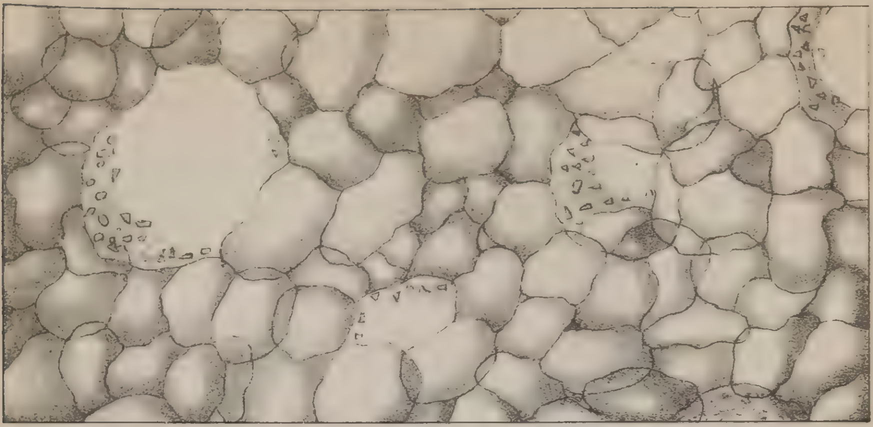

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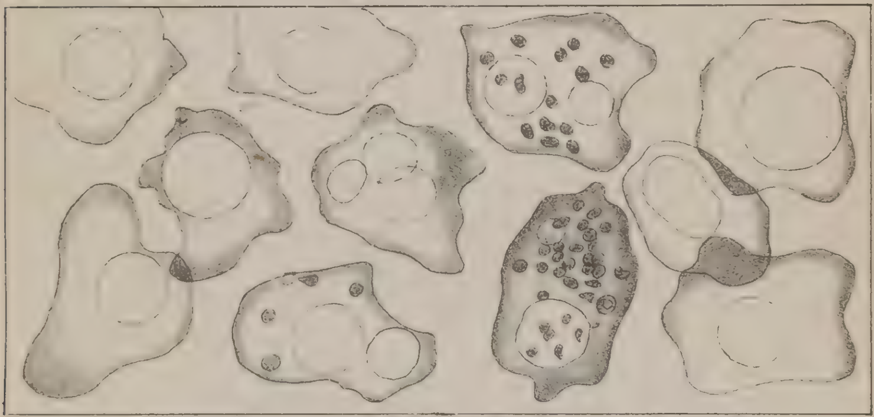

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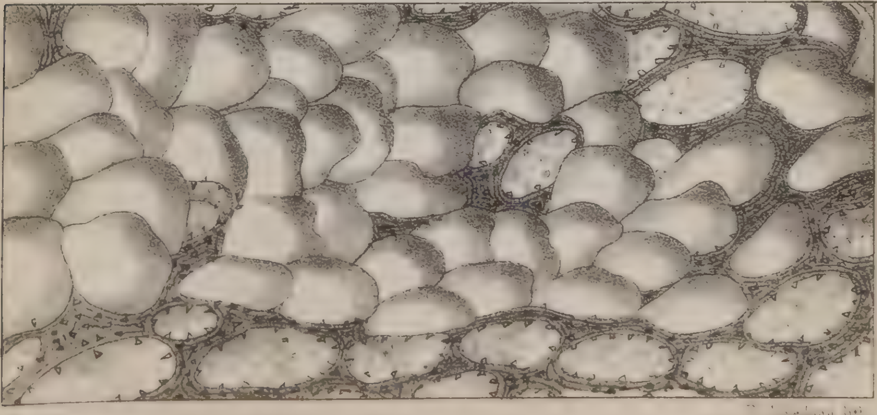

PLATE XLIX.

Fig. 1. A portion of the pleural surface of the human lung, with the vessels of the second order injected. Magnified 100 diameters.

Fig. 2. A section of the human lung, showing the natural appearance and form of the air cells as seen without injection, also exhibiting numerous particles of the conoidal ciliated epithelium which lines them. 100 diameters.

Fig. 3. Capillaries of the human lung. Magnified 100 diameters. The drawing was made from a very beautiful preparation injected by Mr. Quekett.

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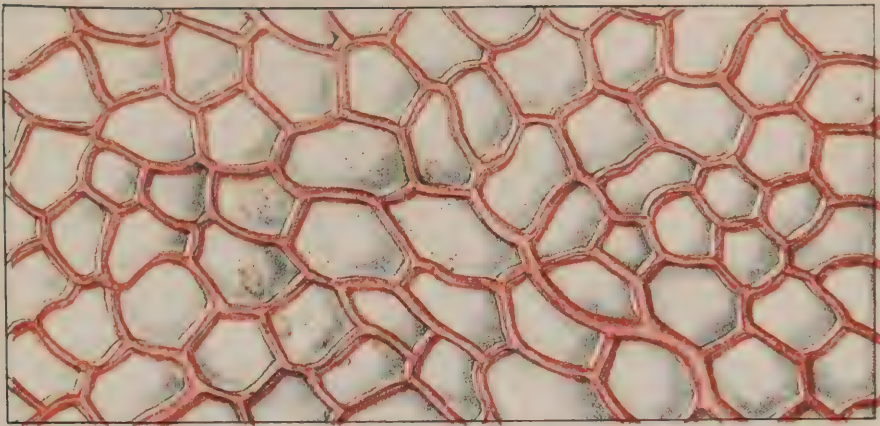

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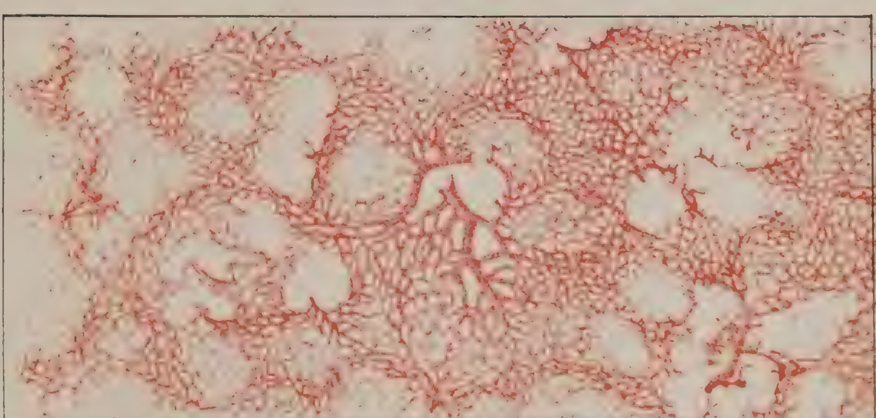

F. C. Kellogg lith

PLATE L.

Fig. 1. Follicles of the stomach, as they appear when lined with conoidal epithelium. 100 diameters.

Fig. 2. Ditto of large intestine in a similar condition. 100 diameters.

Fig. 3. Cross-section of stomach tubes, magnified 100 diameters. The tubes are parcelled out into sets only when about to pierce the follicles into which they open; and it is rare to get a good view of them thus disposed in bundles, each of which corresponds to the base of a follicle.

Fig. 4. Longitudinal view of stomach tubes, magnified 220 diameters, showing the spheroidal or glandular epithelium with which they are lined, as well as the dilated extremities in which they terminate.

Fig. 5. Ditto, magnified 100 diameters.

Fig. 6. Follicles of the large intestine without epithelium, and cut off, so as to admit the passage of light through them: when not thus shortened, their apertures appear dark, in consequence of the non-transmission of the light. 60 diameters.

Fig. 7. Terminations of the follicles of the large intestine. Magnified 60 diameters.

Plate L.

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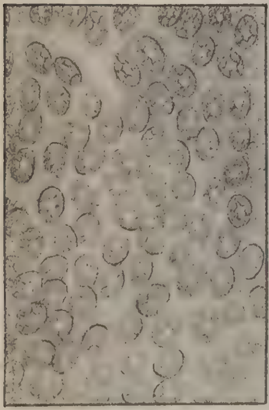

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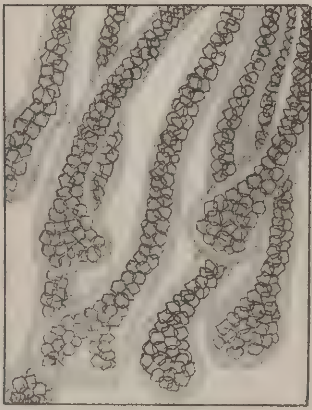

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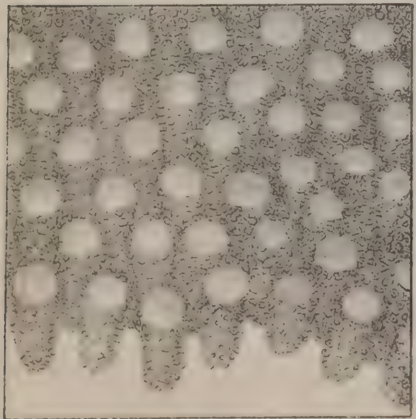

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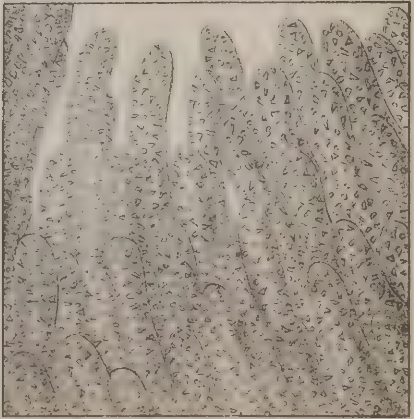

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PLATE LI.

Fig. 1. Blood-vessels of the follicles of the appendix vermiformis injected. Magnified 100 diameters.

Fig. 2. Blood-vessels of the follicles of the stomach of a cat, beautifully injected. The drawing was made from a preparation of Dr. Handfield Jones. 100 diameters.

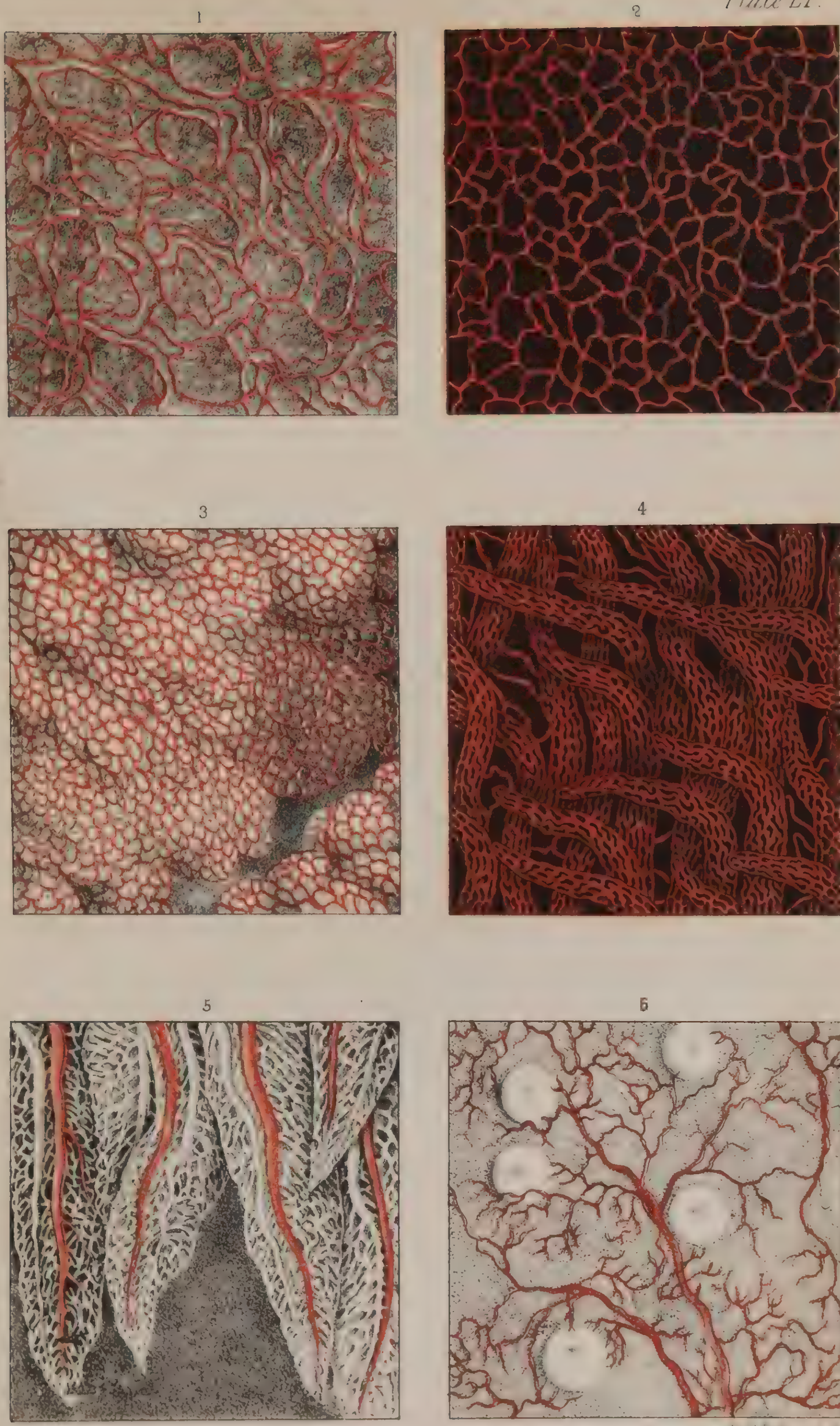
Fig. 3. Villi of the upper part of the small intestine, magnified 60 diameters. Drawing made from a preparation of Dr. Jones.

Fig. 4. Ditto, from the lower portion of the same. 60 diameters.

Fig. 5. Ditto of the foal, injected white and red, the arteries being red and the veins white. Magnified 60 diameters. Drawing made from a preparation presented by Professor Hyrtle, of Prague, to the London Microscopical Society.

Fig. 6. Solitary glands of the large intestine in a case of cholera in a child. Magnified with a lens only.

Plate LI.



H. Müller, del.

PLATE LII.

Fig. 1. Villi, showing the layer of epithelial cells with which they are generally covered, especially during the intervals of digestion. Magnified 100 diameters.

Fig. 2. Ditto, uncovered by the layer of epithelium figured in the previous drawing, and showing the lacteals, as well as the granular cells, which the villi always contain, whether in an active or passive condition. 100 diameters.

Fig. 3. Peyer's glands in the cat. Magnified 20 diameters. The vessels in the villi, between the glands, are injected; but those of the glands themselves are not so, and this accounts for their being uncoloured.

Fig. 4. Vertical section of the mucous membrane of the ileum of the cat, showing the flask-like form of Peyer's glands. No essential difference exists between these glands, as they occur in most of the Mammalia, and in the human subject. This and the previous drawing were prepared from two very perfect preparations, kindly lent me by Mr. Quekett. 20 diameters.

Fig. 5. Follicles of Lieburkühn in the duodenum. Magnified 60 diameters.

Fig. 6. Solitary glands of the small intestines uninjected, of their natural size, and as they occurred in a case of muco-enterite

Plate LII.

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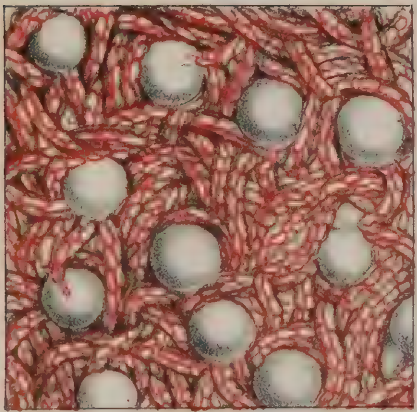

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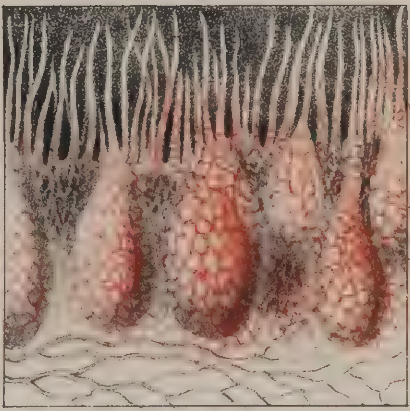

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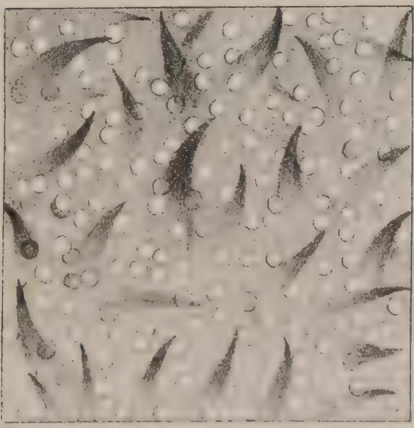

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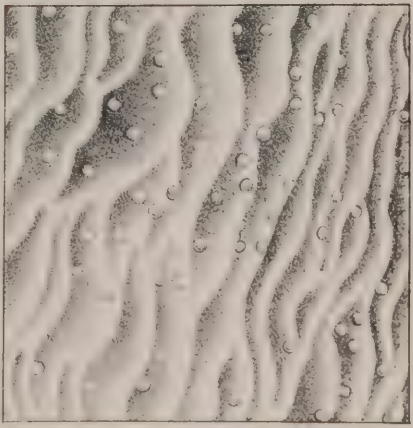

H. Muller del.

E. C. Kellogg lith.

PLATE LIII.

Fig. 1. A sebaceous gland from the caruncula lachrymalis in the human subject; the follicles, on closer examination, I find to be provided with minute hairs, similar to those which are present in the sheep and some other animals.

Fig. 2. An entire Meibomian gland. 27 diameters.

Fig. 3. Sebaceous glands in connexion with a hair of the scalp. These glands are easily procured still attached to the hair follicle, provided the portion of integument from which they are to be obtained be permitted to undergo a slight degree of decomposition. 33 diameters.

Fig. 4. Illustrations of mucous glands. The centre figure represents a portion of a gland and several of the apertures by which the follicles in the larger mucous glands communicate with each other. 45 diameters.

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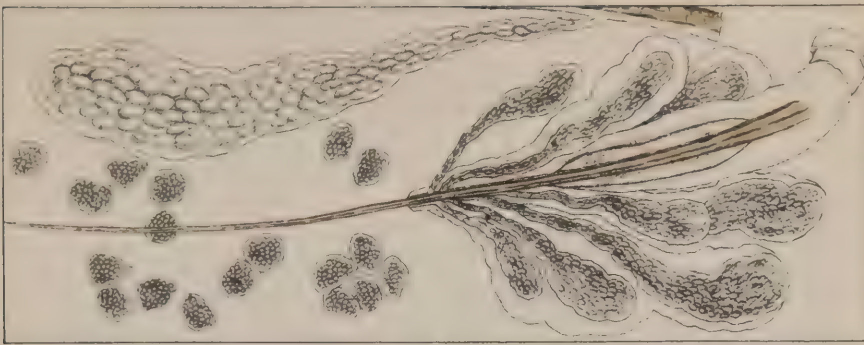

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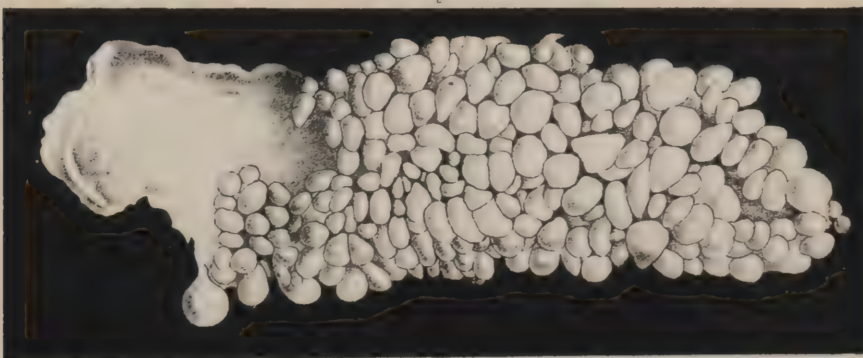

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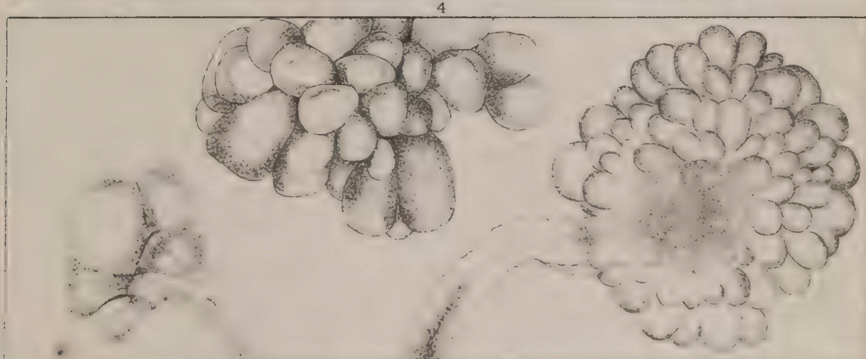

PLATE LIV.

Fig. 1. A portion of the parotid gland of an embryo of the sheep, four inches long, showing it in the very earliest condition of its development in which it can be traced; the follicles, although arranged in clusters, are yet separate and independent of each other. After Müller. Magnified 8 diameters.

Fig. 2. Shows a further development of the parotid gland in the human subject; in this figure the follicles are closely aggregated in clusters, each cluster representing a miniature lobule. 40 diameters.

Fig. 3. A portion of mammary gland filled with milk globules. 90 diameters.

Fig. 4. A section of liver, showing the form of the lobules and the arrangement of the secreting cells. The light spaces in the centre of the lobules indicate the position of the central hepatic veins. 35 diameters.

Fig. 5. A portion of mammary gland, but slightly magnified.

Fig. 6. Ditto, more highly magnified, showing clearly both its small granular secreting cells and the milk globules. 198 diameters.

Plate LIV.

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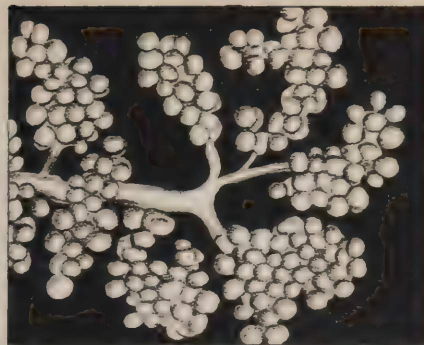

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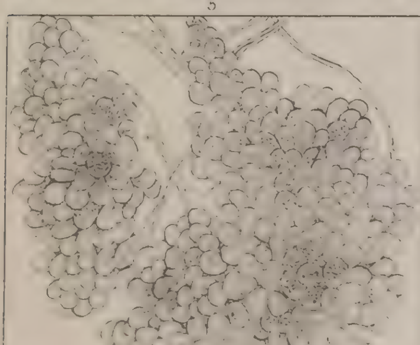

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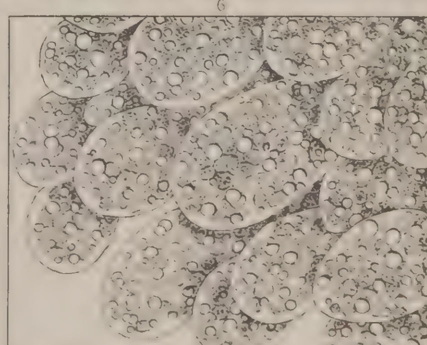

[illegible] Kellogg lith.

PLATE LV.

Fig. 1. A portion of the surface of the liver, showing the lobules and the intra-lobular hepatic veins. The injection has filled only the larger vessels, and has scarcely penetrated to the capillaries. 15 diameters.

Fig. 2. Section of liver, in which the hepatic venous system has been very completely injected, and the portal (in yellow) only slightly so. The communication between the vessels of different lobules is also well shown. Drawing made from a preparation of Dr. Handfield Jones. 20 diameters.

Fig. 3. Would appear to be a portion of the portal system; the injection was thrown in from the ductus communis choledochus. When introduced in this way, this system always becomes irregularly filled; and the lobules are not circumscribed as when the injection enters directly by the portal vein. 20 diameters.

Fig. 4. A section of liver, in which the inter-lobular portal vessels are shown. The injection in this case also fills only the principal vessels, and has not extended to the capillaries. 24 diameters.

Plate LV

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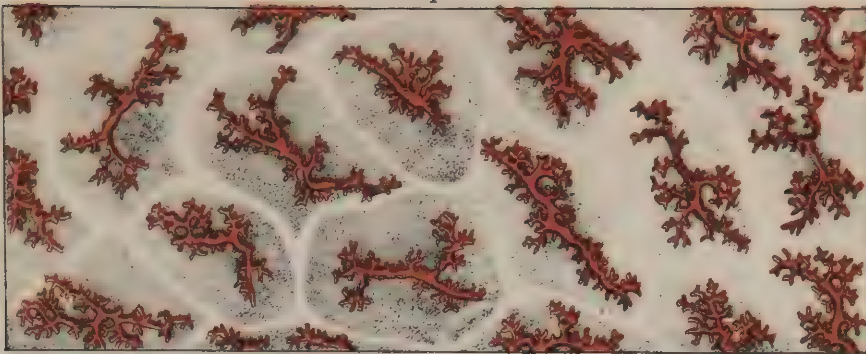

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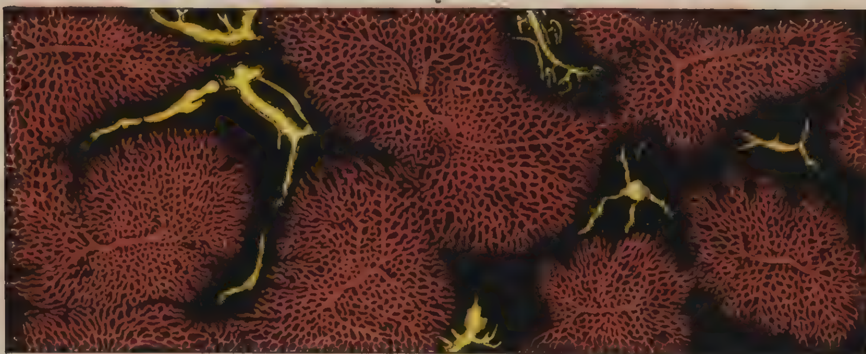

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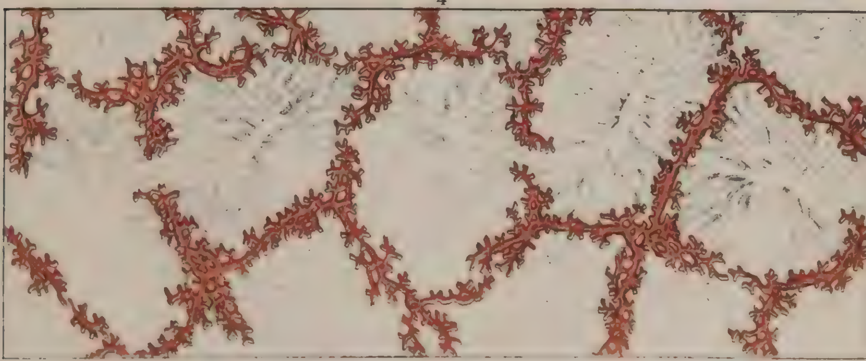

PLATE LVI.

Fig. 1. A portion of the surface of the liver, in which the portal capillary system has been injected. 20 diameters.

Fig. 2. Section of liver, in which both the portal vein and the hepatic artery have been injected, the red vessels indicating branches of the hepatic artery. The drawing was made from a very perfect injection, kindly lent me for the purpose by Mr. Quekett. 18 diameters.

Fig. 3. A portion of the surface of the liver, in which both the hepatic and portal venous systems are well shown, each being distinct. Drawing made from a preparation of Dr. Handfield Jones. 20 diameters.

Fig. 4. A section of liver, in which both the portal and hepatic venous systems have been completely injected from the portal vein. 20 diameters.

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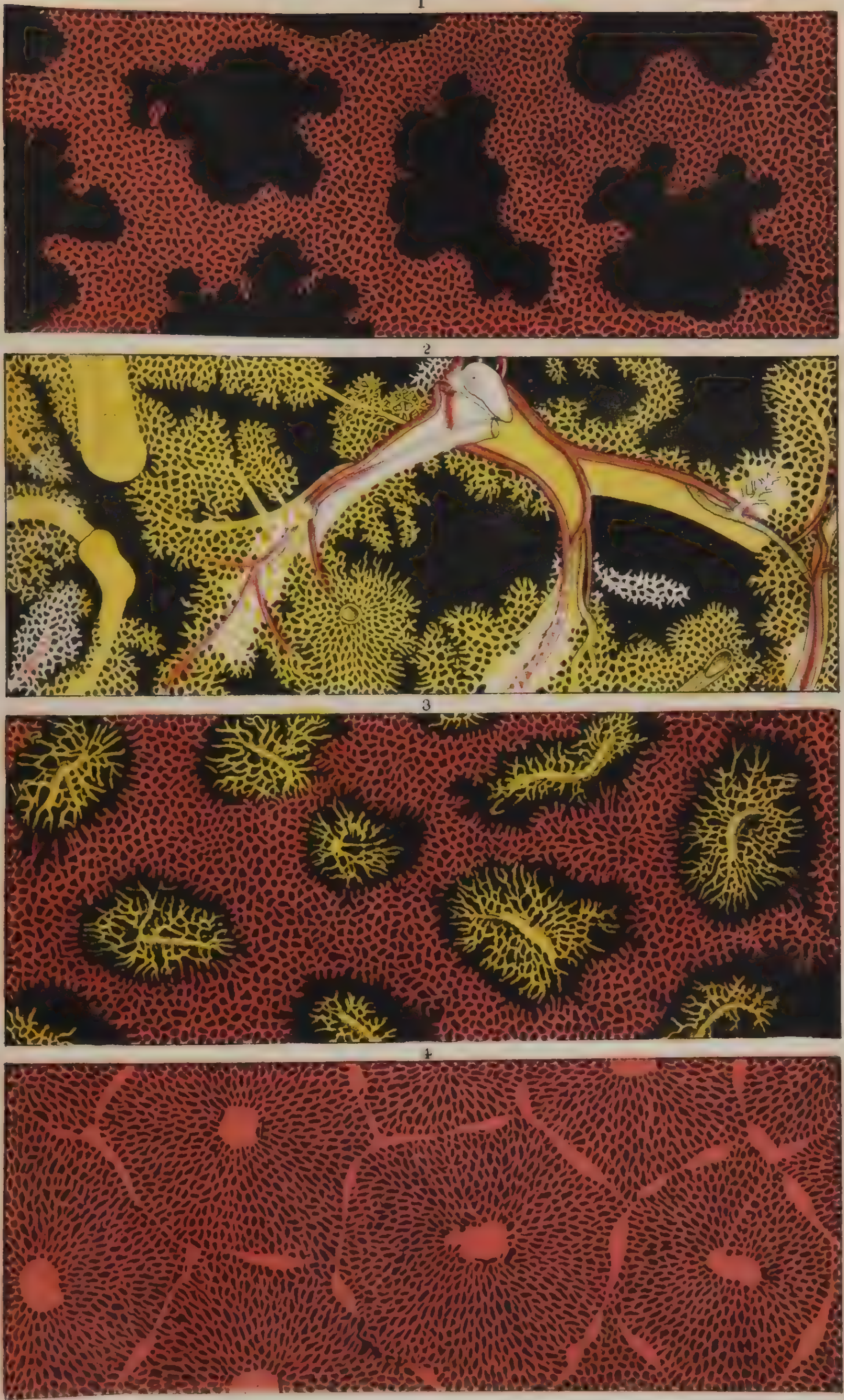

PLATE LVII.

Fig. 1. A terminal biliary duct, copied from a drawing of Dr. H. Jones. 378 diameters.

Fig. 2. Secreting cells of the liver. The group lettered *a* represents the cells in the usual condition in which they are met, when submitted to observation: in *b*, the cells are gorged with bile, while in *c*, they contain numerous fat or oil globules. 378 diameters.

Fig. 3. Concretions or calculi from the prostate gland. 45 diameters.

Fig. 4. *a* represents an hitherto undescribed form of tubular gland occurring in the region of the human axilla in close connexion with the large sudoriferous glands which are there met with. 54 diameters. It differs from these last, however, in several particulars, but principally in the smaller calibre of the tubes, and the presence (clearly shown by the action of acetic acid) of innumerable nuclei in the walls of the tubes, and of which these would appear to be principally constituted. In *b* and *c*, the differences in the size and structure of the tubes in the two glands are shown. *b* and *c* 198 diameters.

Fig. 5. Ceruminous glands. I cannot detect the slightest difference between these glands and ordinary sudoriferous glands, with which, it would appear, they must be considered to be identical. 45 diameters.

Plate LVII

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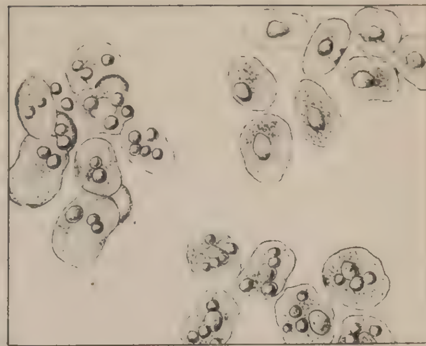

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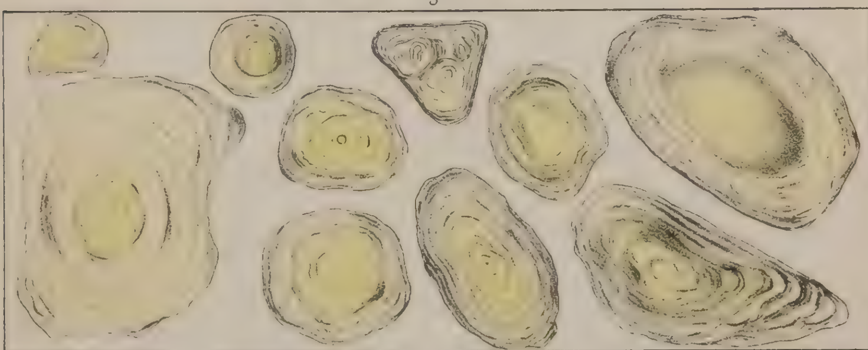

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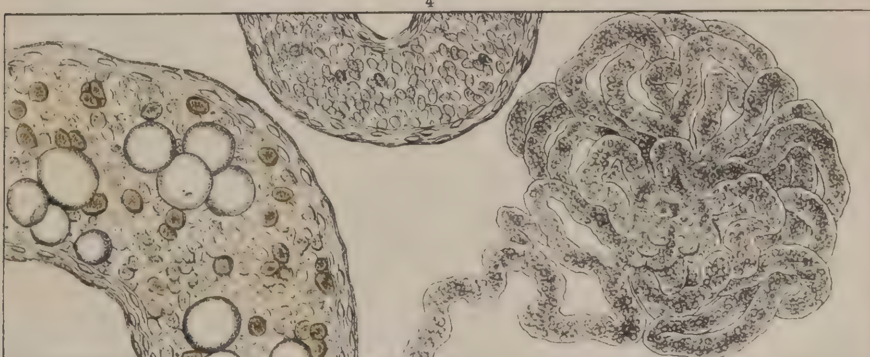

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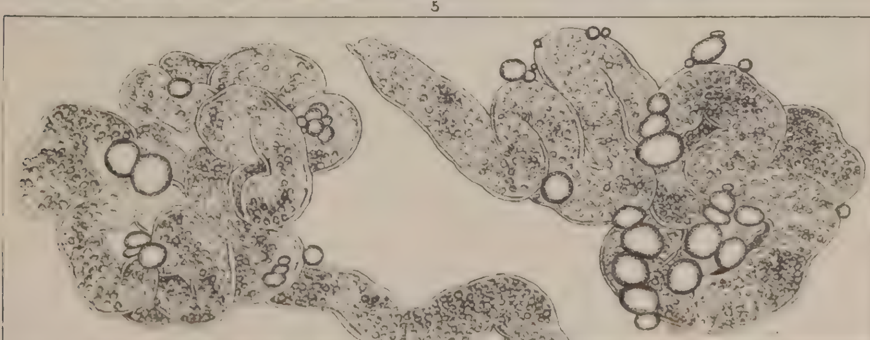


PLATE LVIII.

Fig. 1. Tubes of the kidney, showing their general character, and but slightly magnified. 99 diameters.

Fig. 2. Cross-section of the elastic frame-work in which both the secreting tubes and the Malpighian bodies are enclosed. 99 diameters.

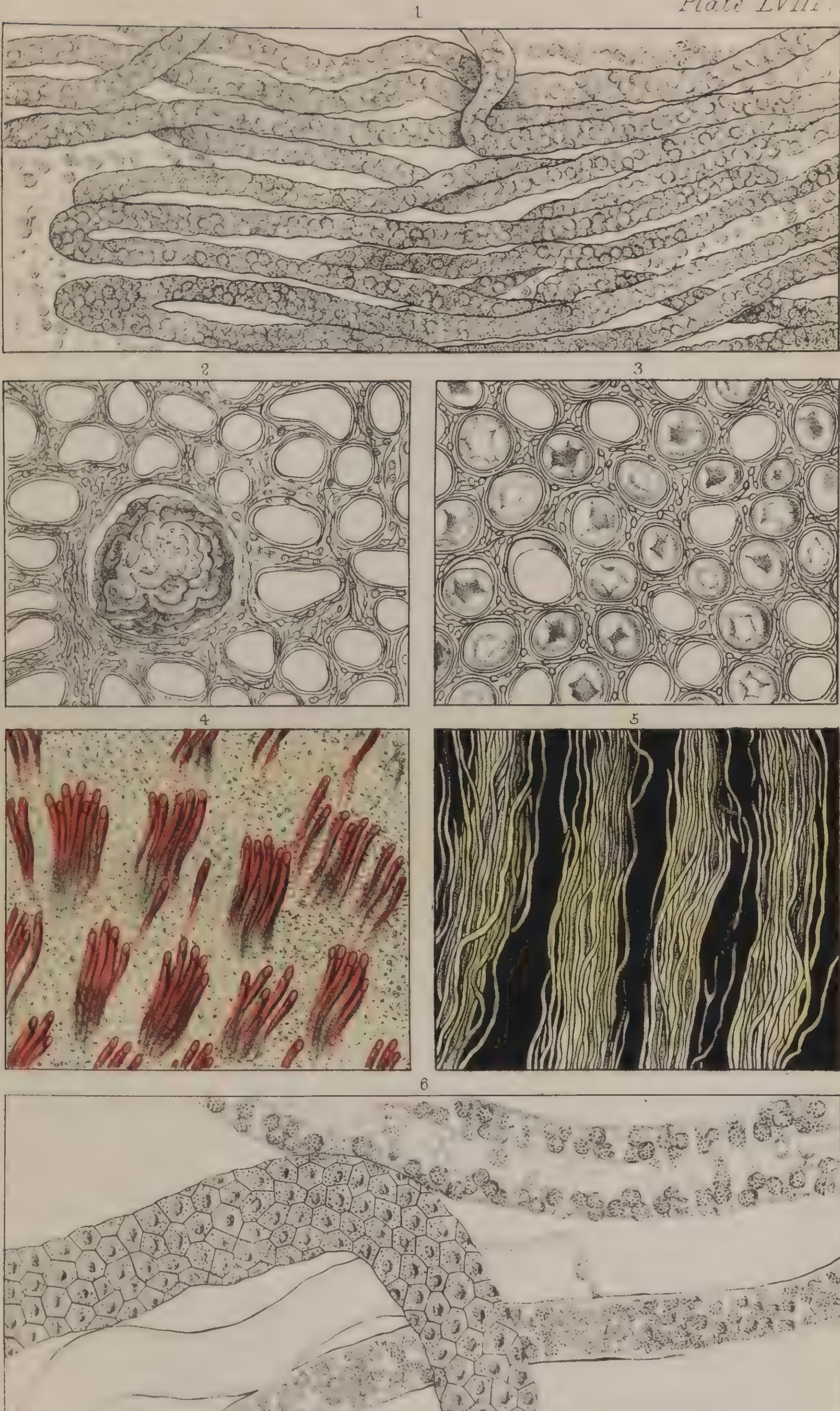
Fig. 3. Cross-section of both the elastic frame-work and the secreting tubes themselves. 99 diameters.

Fig. 4. Oblique section of the veins contained in the tubular part of the kidney, showing their arrangement in sets. 33 diameters.

Fig. 5. The same vessels seen lengthways. 33 diameters.

Fig. 6. Secreting tubes of the kidney, in different conditions: in one, the cells are seen to form a regular pavement epithelium; in a second, the central canal, along which the urine, secreted by the Malpighian bodies and cells of the tubes, flows, is shown; in a third, the cells are irregularly disposed, and this is generally found to be the case in the tubes of the central part of the kidney, and when the kidney is not perfectly fresh; in a fourth, there are no secreting cells, and the structureless basement membrane of the tubes alone remains. 378 diameters.

Plate LVIII.



E. C. Kellogg lith

PLATE LIX.

Fig. 1. Longitudinal section of kidney, showing the corpora Malpighiana. Magnified 40 diameters.

Fig. 2. Uriniferous tubes of a bird (*Gallus indicus*), showing their pinnatifid arrangement. Drawing made from a preparation of Professor Hyrtl, in the possesion of the Microscopical Society of London. 40 diameters.

Fig. 3. Corpora Malpighiana of the horse. Drawing made from an injected preparation by Professor Hyrtl. 40 diameters.

Fig. 4. Vessels of the surface of the kidney. The capillaries are situated in the interstices between the tubes. 90 diameters.

Fig. 5. A transverse section of the kidney, more highly magnified, showing the convoluted vessels of the corpora Malpighiana, as well as the capillaries which encircle the uriniferous tubes. 67 diameters.

Plate LIX

H. M. [illegible] del. E. C. Kellogg lith

PLATE LX.

Fig. 1. Tubes of the testis, slightly magnified, showing their general appearance and arrangement.

Fig. 2. Uninjected corpora Malpighiana. *a* is enveloped in its own proper capsule, while in *b* this has been removed. Magnified 100 diameters. Additional observations have convinced me that these complicated bodies are invested, in addition to the thick elastic covering spoken of in the text, with an inner and much thinner membrane; and that it is this which is to be regarded as the proper Malpighian capsule. This covering, I conceive, is conveyed to each Malpighian body by the afferent artery, from which it is reflected over the Malpighian dilatation and plexus of vessels; and it may often be seen as a distinct structure, partially separated from the other constituents of a Malpighian body. The frame-work of elastic tissue, which invests on every side the tubes and Malpighian bodies, is every where continuous by its outer surface, that of one tube with that of the neighbouring tubes, and that of the Malpighian body is also continuous with that of the tubes which surround this Malpighian body. On the other hand, the proper and thin Malpighian capsule is smooth on its outer surface, and not connected by this surface with any other structure, save the afferent and efferent vessels along which it is continued. This general continuity of the elastic framework is well shown in Plate LVIII. *fig*. 2.

Fig. 3. *A*, a Malpighian body, more highly magnified, displaying innumerable small oval and granular cells. The majority of these, I am now disposed to think, are contained in the walls of the vessels constituting the Malpighian plexus. The figure *b* is after Bowman, and shows the afferent artery and the efferent vein of the Malpighian tuft; also, the connexion of the tube with the Malpighian body itself; *c*, loose epithelial cells of the tubes. 125 diameters.

Fig. 4. Tube of the testis, more highly magnified, displaying the innumerable granular cells which fill the tube, as well as the structure of the tube itself. 99 diameters.

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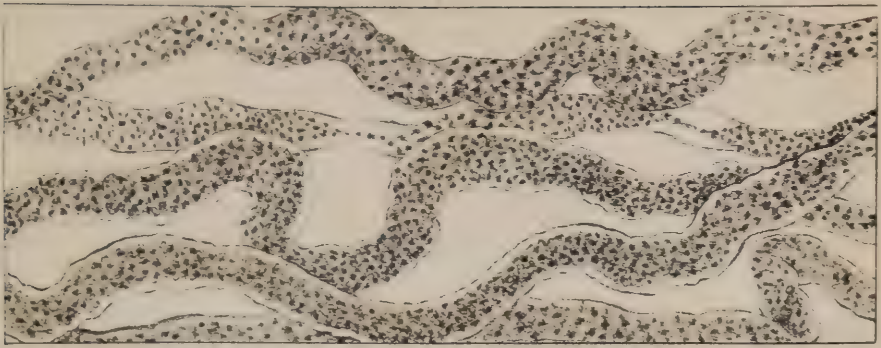

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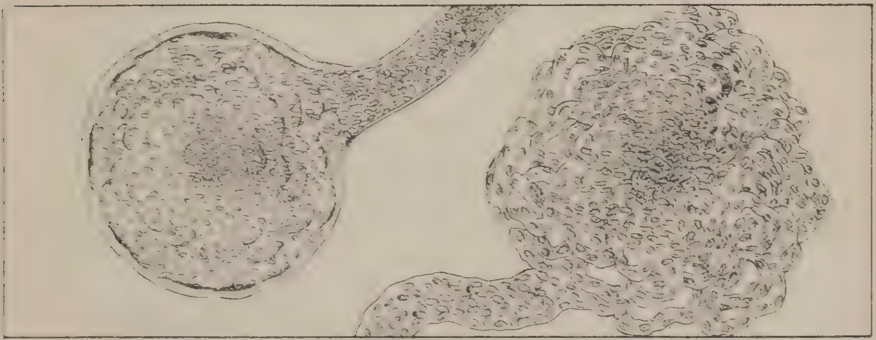

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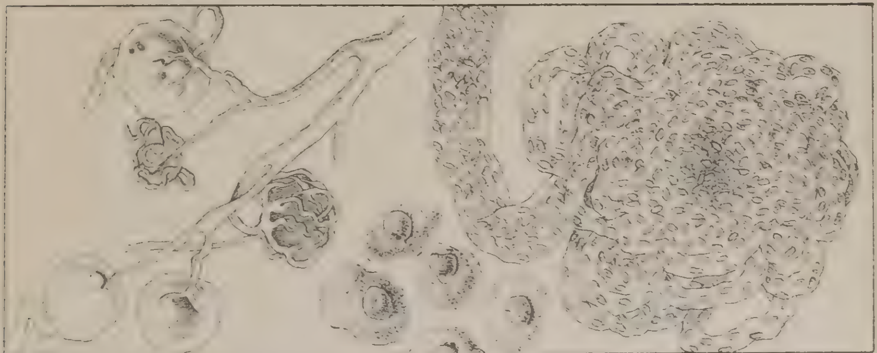

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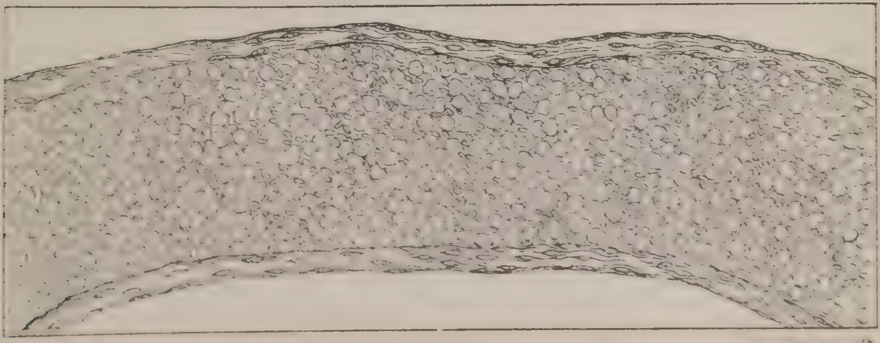

PLATE LXI.

Fig. 1. Vessels of thyroid gland. 18 diameters.

Fig. 2. Vesicles of slightly enlarged thyroid, viewed with a lens only.

Fig. 3. Ditto of same, magnified 40 diameters.

Fig. 4. Ditto of same, magnified 67 diameters, showing the fibrous structure of their walls, and their cellular and nuclear contents.

Fig. 5. Lobes and vesicles of thyroid, magnified 27 diameters, as seen in a gland in its ordinary condition.

Fig. 6. Granular nuclei of vesicles of thyroid. Magnified 378 diameters.

Fig. 7. Two follicles of thymus gland, magnified 33 diameters, showing the plexus of vessels which invests them.

Fig. 8. A portion of the capsule of thymus, magnified 54 diameters, showing the ternary disposition of the vessels.

Fig. 9. Granular nuclei and simple cells with fibrous tissue of thymus. Magnified 378 diameters.

Fig. 10. Compound cells of thymus. Magnified 378 diameters.

Plate LXI.

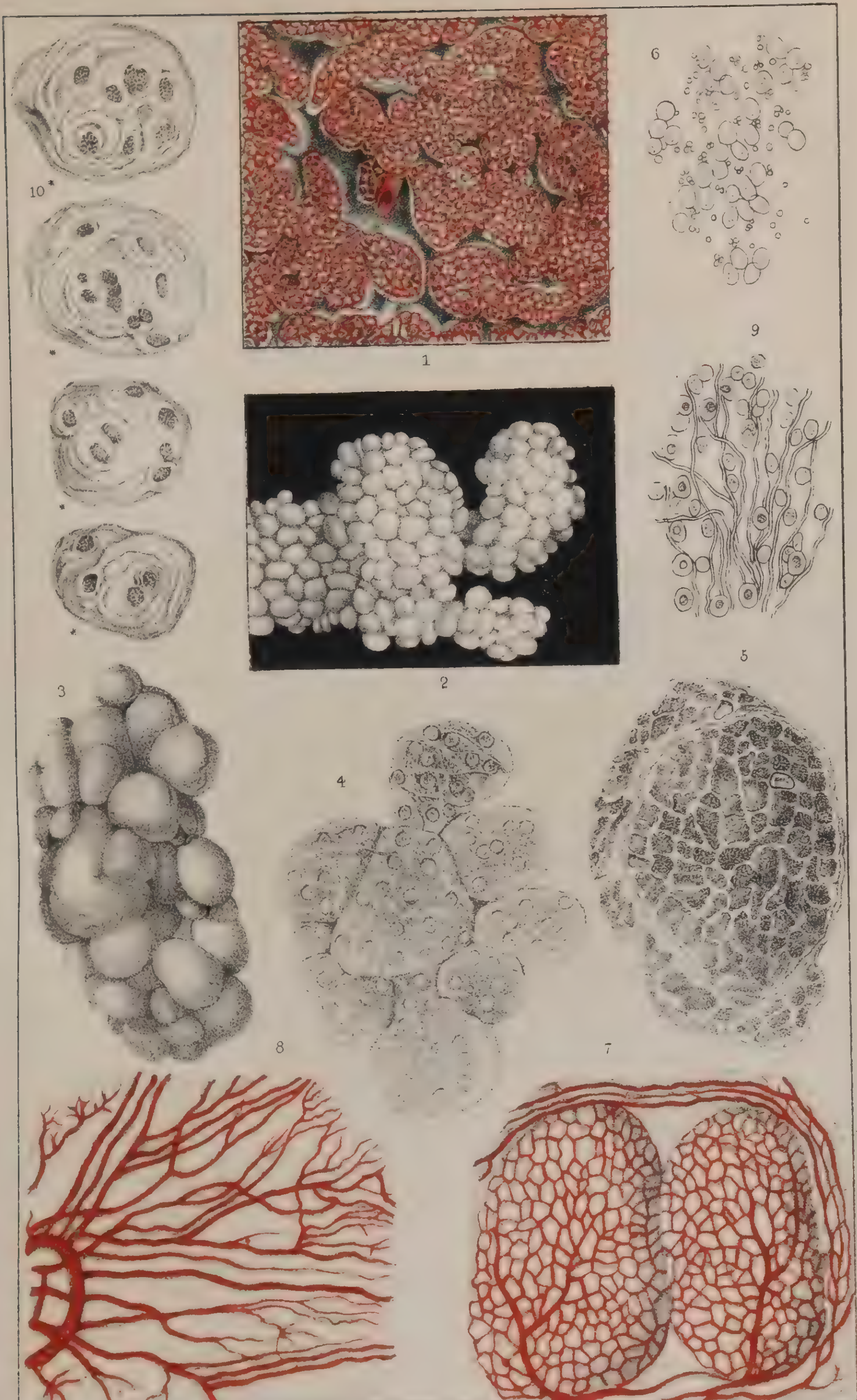

PLATE LXII.

Fig. 1. Granular nuclei, blood-vessels, and fibro-elastic tissue of spleen. * Magnified 378 diameters.

Fig. 2. Plexus of vessels on the surface of supra-renal capsule. Magnified 54 diameters.

Fig. 3. A. Tubes of supra-renal capsule. 90 diameters. B. Nuclei, parent cells, and molecules of the same. 378 diameters.

Fig. 4. Vessels of the fœtal portion of the placenta. Magnified 54 diameters. These are seen to terminate in the villi in loops.

Fig. 5. Ditto of the supra-renal capsule, showing the plexus on the surface of the organ, the long inter-tubular vessels, and the central plexus. 90 diameters.

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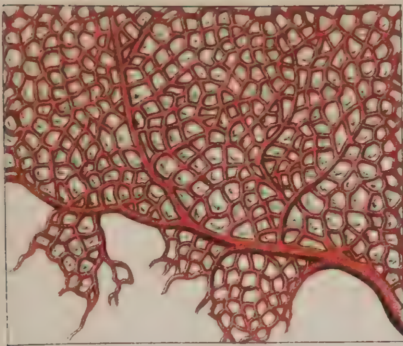

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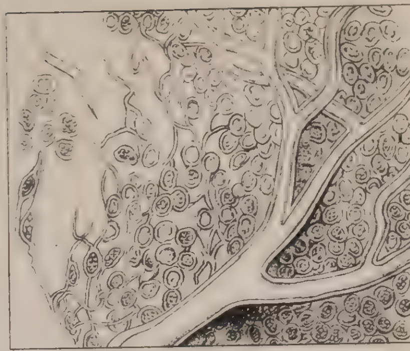

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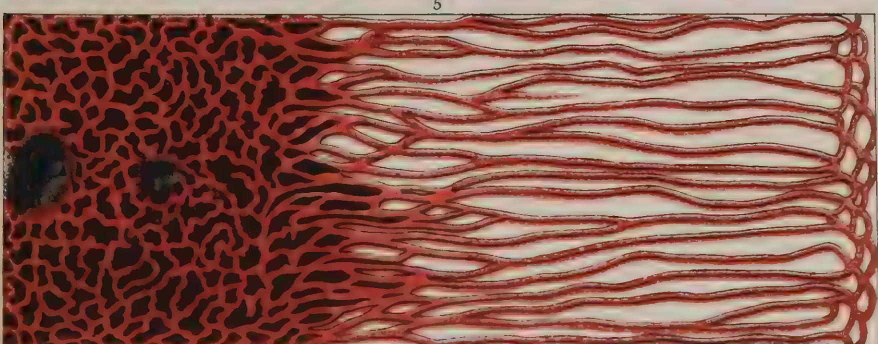


C. Gruber del. E. C. Kellogg lith.

PLATE LXIII.

Fig. 1. Epidermis of palm of hand, magnified 40 diameters, showing its disposition in ridges, and the apertures of the sudoriferous glands.

Fig. 2. Epidermis of the back of the hand, magnified to the same extent, showing its furrows, hairs, and apertures of sudoriferous ducts.

Fig. 3. Papillæ of palm of hand. Magnified 54 diameters.

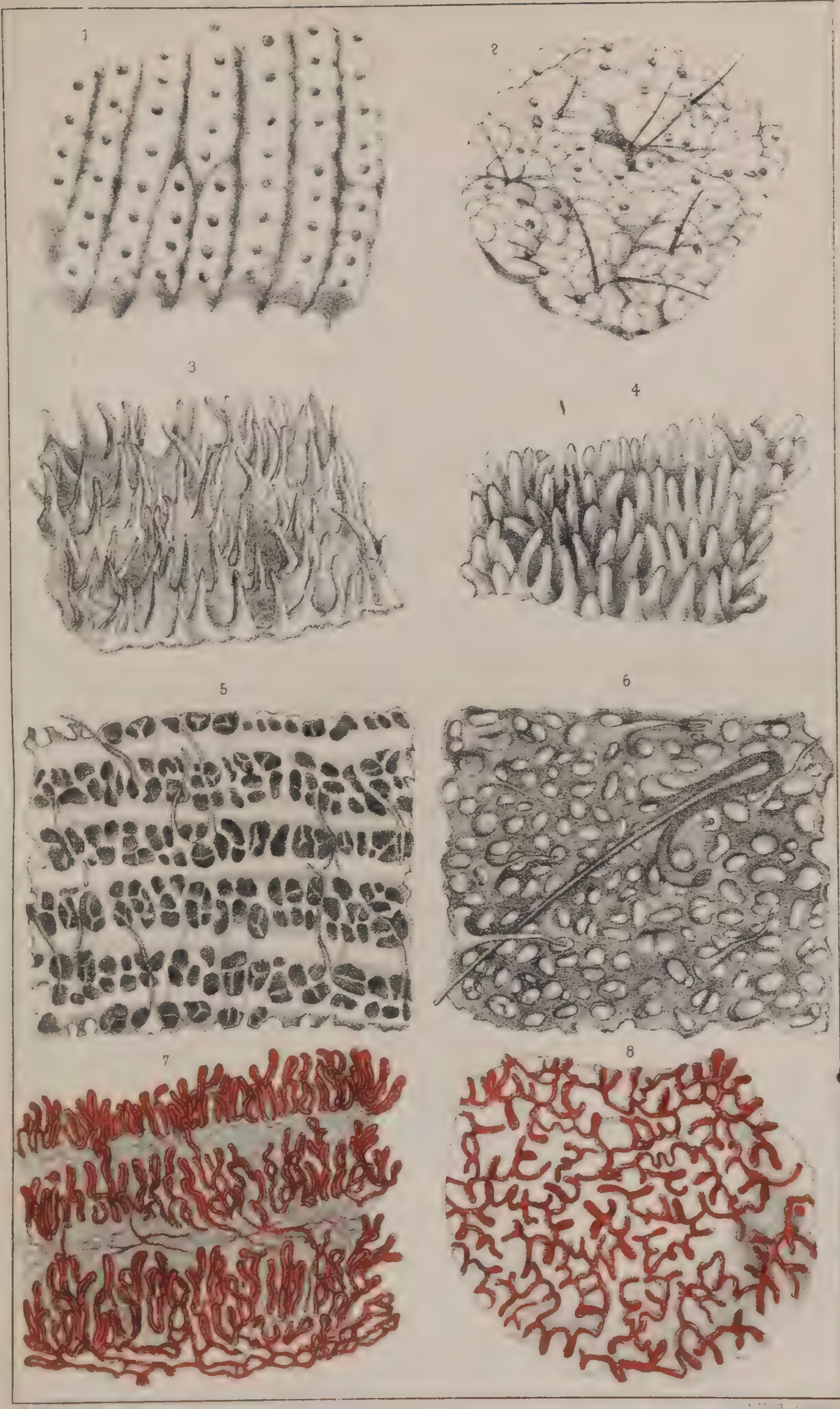
Fig. 4. Ditto of back of hand. Magnified to the same extent.

Fig. 5. Epidermis of palm of hand, seen upon its under surface, showing pits or depressions for the reception of the papillæ, and the ducts of the sudoriferous glands. Magnified 54 diameters.

Fig. 6. Epidermis of the back of hand, viewed upon its under surface as a transparent object, and showing depressions for the papillæ and the ducts of the sudoriferous glands. Magnified 54 diameters.

Fig. 7. Blood-vessels of the papillæ of the palm of the hand, a single loop corresponds to each papilla. Magnified 54 diameters.

8. Ditto of the back of the hand. Magnified 54 diameters



E. Miller del. | [illegible] lith.

PLATE LXIV.

Fig. 1. Filiform papillæ of the tongue near its centre, with epithelial appendages attached. Magnified 41 diameters.

Fig. 2. Ditto of same near its apex, with epithelial appendages attached; these are seen to be much shorter than in the previous case. Magnified 27 diameters.

Fig. 3. Ditto near the apex of the tongue, with the epithelium removed, showing their cupped form, and the arrangement and number of the secondary papillæ around their edges. Magnified 27 diameters.

Fig. 4. Ditto near the centre of the tongue, in which situation the secondary papillæ are seen to be much longer and more slender than in the previous figure, their apices falling together, and so obscuring the excavation in the centre of each filiform papilla. Magnified 31 diameters.

Fig. 5. Filiform and fungiform papillæ of the tongue, deprived of their epithelium. The size, form, and structure of the fungiform papillæ are well shown, as well as the simple papillæ situated in the fossa around the base of one of the fungiform papillæ. Magnified 27 diameters.

Fig. 6. Filiform papillæ; some deprived of their epithelial processes, others still retaining them. In the centre of the figure, two filiform papillæ may be seen occupying the position of a fungiform papilla, being situated in a fossa studded with simple papillæ. 27 diameters.

Fig. 7. The centre of this figure represents a peculiar form of compound papillæ, occupying the position of a fungiform papilla, but intermediate in structure between it and a filiform papilla. 27 diameters.

Fig. 8. Filiform papillæ, showing their tubular form, with the epithelial processes partially removed, and exhibiting numerous simple papillæ placed between the compound ones. 27 diameters.

Plate LXIV

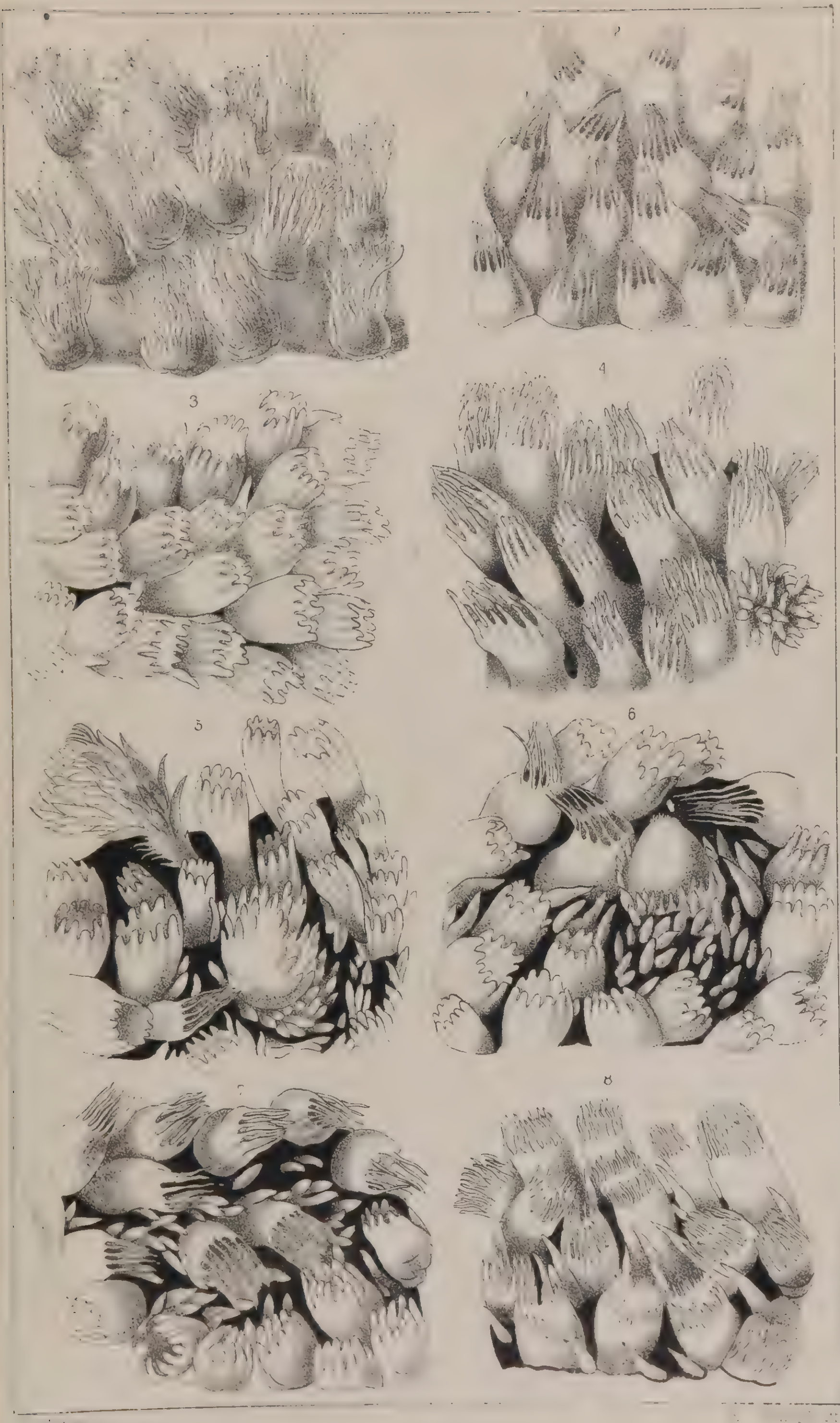


PLATE LXV.

Fig. 1. Mucous follicles of tongue, from under surface, clothed with their epithelium. Magnified 27 diameters.

Fig. 2. Ditto, with the epithelium removed, viewed as transparent objects. Magnified 27 diameters.

Fig. 3. Ditto, with the epithelium removed, viewed as opaque objects. 27 diameters.

Fig. 4. Filiform papillæ, still invested with epithelium, from the apex of the tongue near the tip. In this situation the filiform processes are almost entirely absent, and the cupped form of the papillæ is well seen. 27 diameters.

Fig. 5. Mucous follicles and compound papillæ, still invested with epithelium, from the side of the tongue. Magnified 20 diameters. These compound papillæ approach the fungiform in structure.

Fig. 6. A side view of two simple papillæ of the tongue partially invested with epithelium. 45 diameters.

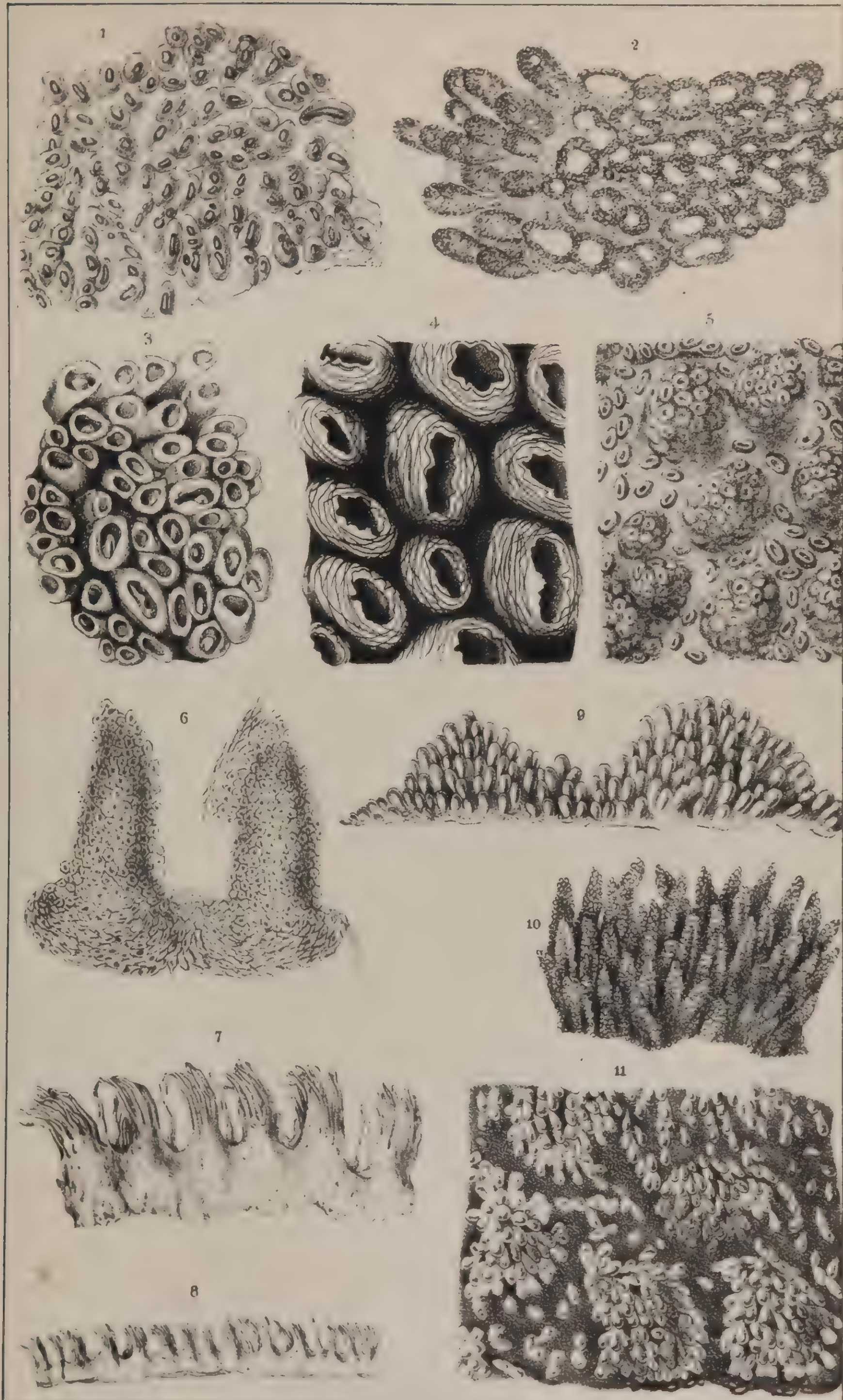
Fig. 7. Ditto of filiform papillæ, with epithelium and epithelial processes still adherent. 18 diameters.

Fig. 8. The same, viewed with a lens only.

Fig. 9. Side view of compound papillæ situated at the sides of the tongue posteriorly to the calyciform papillæ: the simple papillæ of which they are made up are dilated at the extremities. 20 diameters.

Fig. 10. Simple papillæ from the under surface of the tongue. Magnified 54 diameters.

Fig. 11. Compound and simple papillæ from the side of the tongue, but posteriorly to the calyciform papillæ. Magnified 23 diameters.



H Miller del ad nat.

PLATE LXVI.

Fig. 1. A single calyciform papilla, with the epithelium removed, showing the numerous secondary papillæ by which it is covered. 16 diameters.

Fig. 2. Ditto, in a similar state, with the vessels of the papillæ injected. 16 diameters.

Fig. 3. Filiform papillæ near the centre of the tongue, with the vessels injected. 27 diameters.

Fig. 4. Ditto near the tip of the tongue, also injected. 27 diameters.

Fig. 5. Simple papillæ, injected. 27 diameters.

Fig. 6. A fungiform papilla, injected, surrounded by several filiform papilla, also injected. 27 diameters.

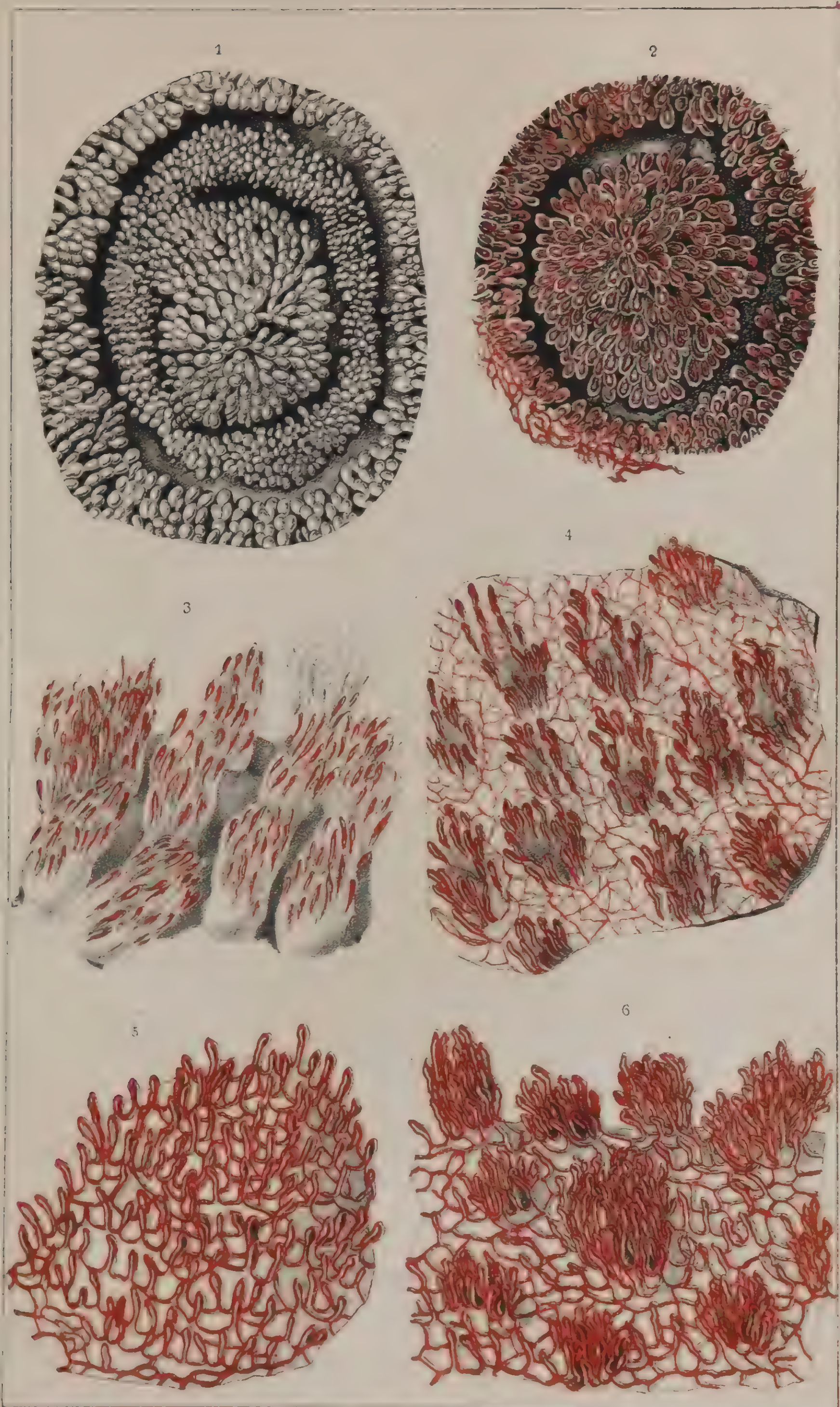

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PLATE LXVII.

Fig. 1. Vertical section of cornea, showing the conjunctival epithelium, the cornea proper, posterior elastic lamina, and epithelium of the aqueous humour. 54 diameters.

Fig. 2. A portion of the vascular layer of the retina, injected. From a preparation belonging to Mr. Quekett. 60 diameters.

Fig. 3. Section of sclerotic and cornea at the junction of the two parts. In the sclerotic, the spaces between the fibrous tissue are seen to be more or less rounded, while in the cornea they are elongated and tubular. 54 diameters.

Fig. 4. Vessels of tunica Ruyschiana, ciliary processes, iris, and membrana pupillaris, injected. From a fœtal preparation injected by Mr. Hett. 14 diameters.

Fig. 5. Nuclei of the granular layer of the retina. 378 diameters.

Fig. 6. Cells of the same. 378 diameters.

Fig. 7. Transparent cells of the vesicular layer of the retina. Magnified 378 diameters.

Fig. 8. Caudate cells of the retina. 378 diameters.

Fig. 9. A portion of the membrana Jacobi. 378 diameters.

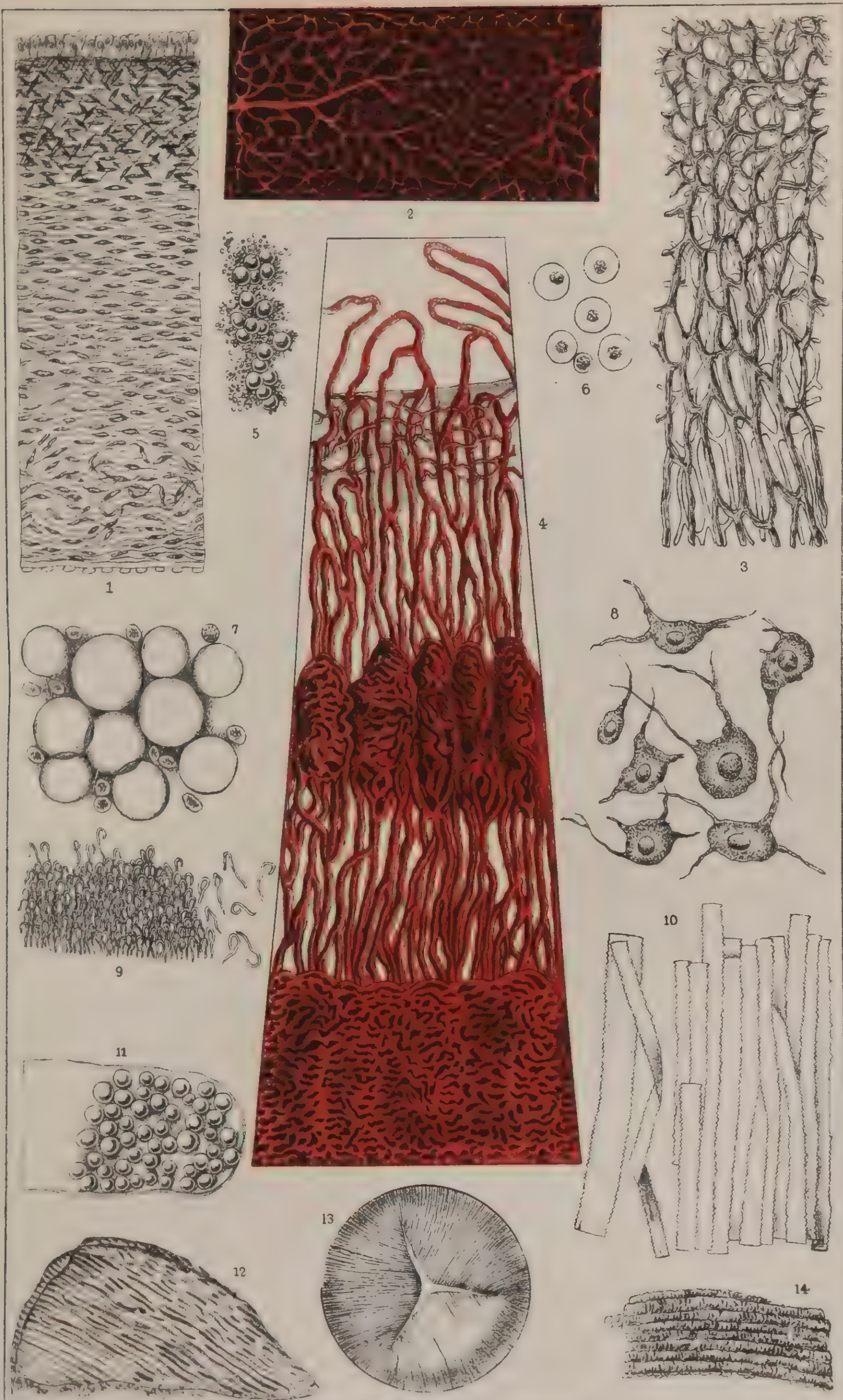
Fig. 10. Fibres of the crystalline lens. *a*, magnified 198 diameters; *b*, magnified 378 diameters.

Fig. 11. Tuberculated condition of the posterior elastic lamina, as seen near its margin. 78 diameters.

Fig. 12. Peculiar markings on posterior elastic lamina. Magnified 78 diameters.

Fig. 13. Surface of crystalline lens of the sheep, slightly magnified, showing the three radii, and the course of the fibres.

Fig. 14. Fibres of the lens near its centre, where they are much smaller than on the surface. 198 diameters.



H Miller del ad nat

E C Kelig, lith

PLATE LXVIII.

Fig. 1. Globe of the eye of the sheep, magnified 3 diameters. The sclerotic being removed, the choroid is seen, as well as the disposition of the stellate pigment cells, which lie in the intervals between the venæ vorticosæ, and which consequently follow a similar disposition.

Fig. 2. The same, showing the venæ vorticosæ injected. Magnified 3 diameters.

Fig. 3. Conjunctival epithelium, oblique view of. 378 diameters.

Fig. 4. A portion of the ciliary muscle. 198 diameters.

Fig. 5. Conjunctival epithelium, front view of. 379 diameters.

Fig. 6. Gelatinous nerve fibres of retina. 378 diameters.

Fig. 7. Cellated structure of the vitreous body. 70 diameters.

Fig. 8. Elastic fibres lying on the anterior surface of the posterior elastic lamina. 70 diameters.

Fig. 9. A portion of iris, showing its blood-vessels and muscular fibrillæ. 70 diameters.

Fig. 10. Epithelium of the crystalline lens. 198 diameters.

Fig. 11. Ditto of the aqueous humour. 198 diameters.

Fig. 12. Cells of the hexagonal epithelium of the choroid. Magnified 378 diameters.

Fig. 13. Cells and fibres of the stellate pigment of the choroid. 378 diameters.

Fig. 14. Irregular pigment cells of the uvea. 378 diameters.

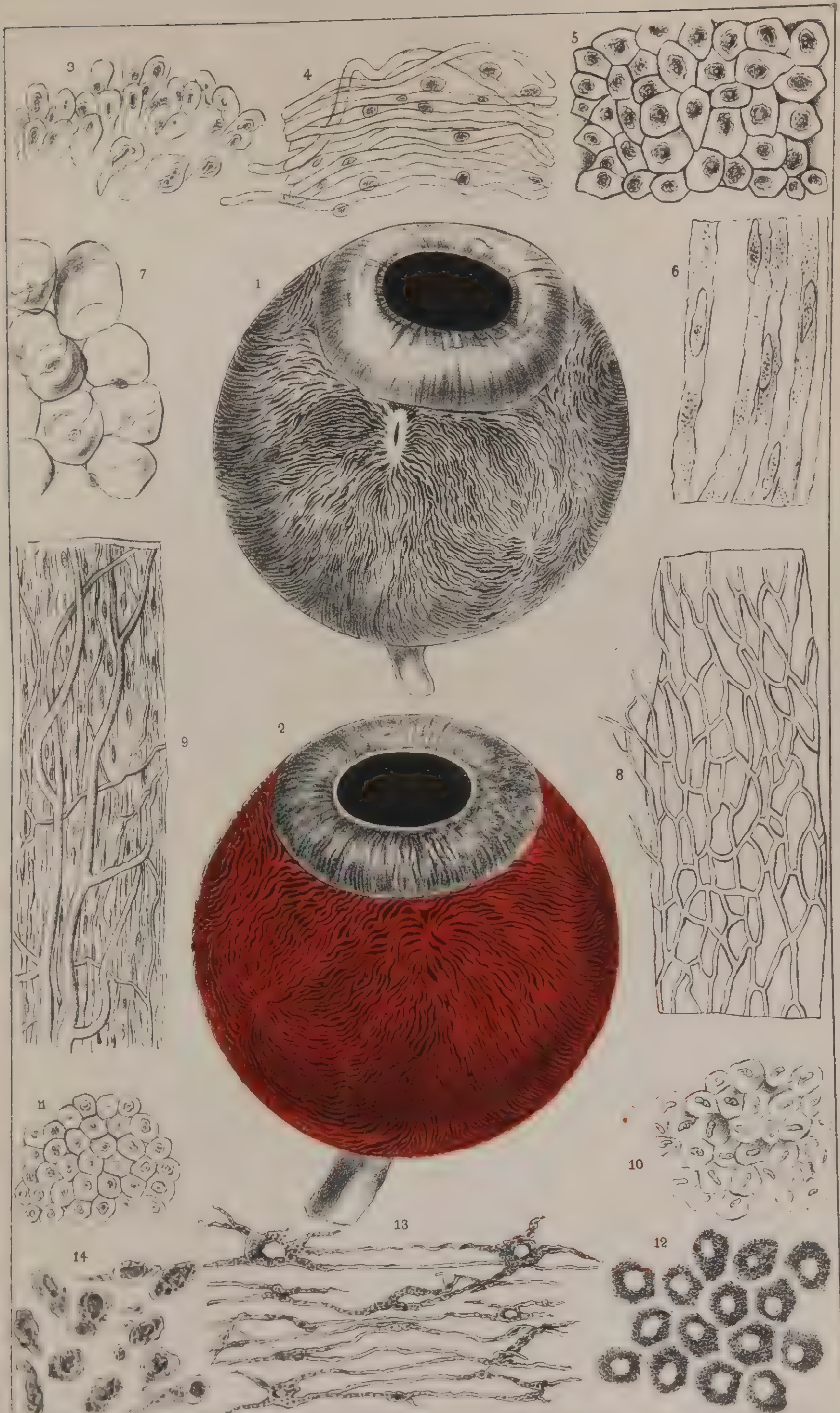

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PLATE LXIX.

Fig. 1. A portion of the mucous membrane of the olfactory region of the sheep, showing the apertures of the mucous follicles, and the pigment which covers its surface. 80 diameters.

Fig. 2. Blood-vessels of the pituitary region, injected. From a preparation belonging to Mr. Quekett. 80 diameters.

Fig. 3. Denticulate lamina of the osseous zone of the lamina spiralis, seen on the vestibular surface. *a*, free edge of the teeth; *b*, margin towards the axis of the cochlea; *c*, granular cells lying upon the same. 100 diameters.

Fig. 4. Tympanic surface of a portion of lamina spiralis of the cat. *a*, termination of the cochlear nerves at the border of the osseous zone, with capillaries ramifying over them; *b*, inner clear belt of the membranous zone; *c*, marginal capillary on the tympanic surface; *d*, pectinate portion of the membranous zone; *e*, outer clear belt of membranous zone, torn from the cochlearis muscle. 300 diameters. After Todd and Bowman.

Fig. 5. Inner view of cochlearis muscle of the sheep. *a*, line of attachment of membranous zone of lamina spiralis, of which a portion, *b*, remains attached. The surface below this line is in the scala tympani; the surface above, the scala vestibuli. *c*, projecting columns, with intervening recesses, in the vestibular part of the cochlearis muscle. After Todd and Bowman.

Fig. 6. Plexiform arrangement of the cochlear nerves, seen in the basal coil of the lamina spiralis, treated with hydro-chloric acid. There are no ganglion globules in this plexus, which consists of tubular fibres. *a*, twig of cochlear nerve in the modiolus, its fibres diverging and rëuniting in *b*, a band in

the plexus taking a direction parallel to the zones. From this, other twigs radiate, and again and again branch and unite as far as the margin of the osseous zone, *c*, where they terminate. From the sheep. 30 diameters. After Todd and Bowman.

Fig. 7. Compound cellular and calcareous bodies of the pineal gland. 130 diameters.

Fig. 8. Granular cells and fibrous tissue of the pituitary gland. 350 diameters.

Fig. 9. Villi of the choroid plexus, showing their epithelium and blood-vessels. 45 diameters.

Figs. 10 and 11. Illustrations of the development of fat. *a*, represents the vesicles contained in parent cells; *b*, the same after the absorption of the parent cell membranes. Magnified 45 diameters.

Fig. 12. Dilated capillaries of olfactory region of human fœtus. 100 diameters. From a preparation belonging to Mr. Quekett.

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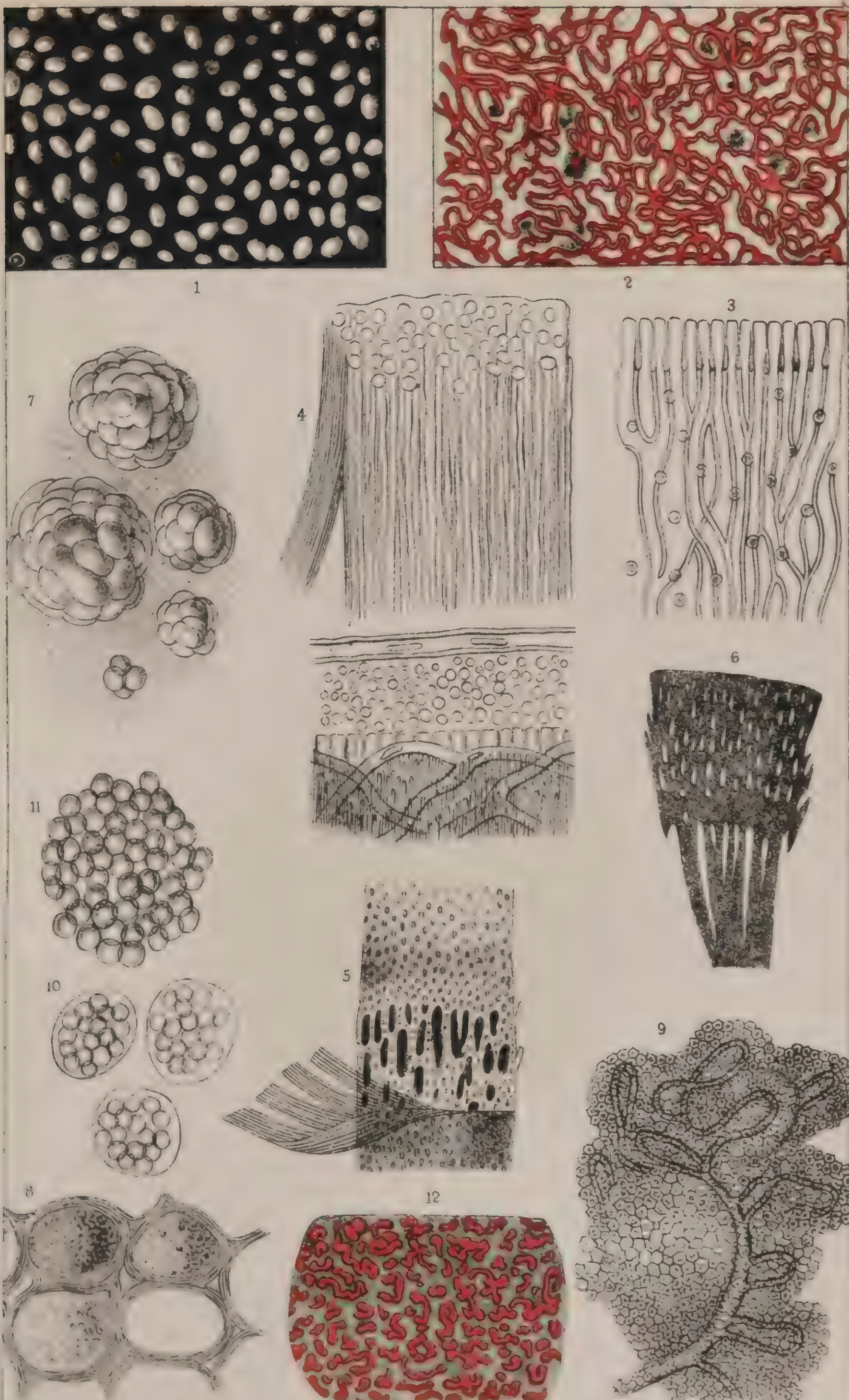
Plate LXIX



ADDITIONAL PLATES

TO THE

AMERICAN EDITION.

PLATES ADDED TO THE AMERICAN EDITION.

PLATE LXX.

Fig. 1. Corpuscles of lymph, showing their granular structure; although really smaller than the colourless corpuscles of the blood (Plate I. *figs.* 1, 2, and 6), they here appear larger in consequence of being more magnified. 800 diameters.

Fig. 2. Chyle from a mesenteric gland; the molecular base, with the granular corpuscles of the same size as those of lymph. 800 diameters.

Fig. 3. Fat vesicles from the arm, injected. The vessels are here seen to be numerous. As yet, no terminal branches of nerves or lymphatics have been traced in these vesicles. Nerves, however, may pass through them to reach other points. Gurlt has stated that in emaciated subjects the fat vesiclescontain serum. Todd and Bowman have detected in emaciated subjects a spontaneous separation of the solid and fluid principles of the contents of the fat vesicles. 45 diameters.

Fig. 4. Transverse sections of human hair. 450 diameters.

Fig. 5. Cartilage from the finger-joint; it exhibits the manner in which the vessels on the edge of cartilage form their terminal loopings. 80 diameters.

Fig. 6. Exhibits the contorted and looped vessels of the synovial membrane. 45 diameters.

Plate LXX

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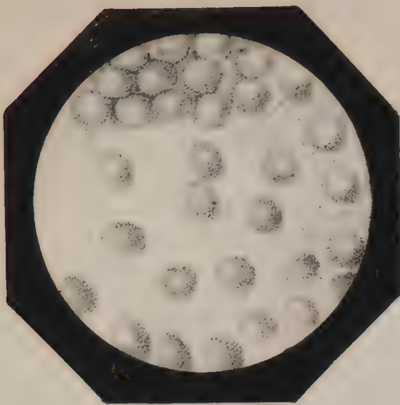

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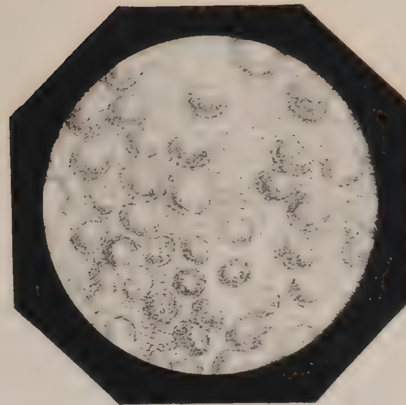

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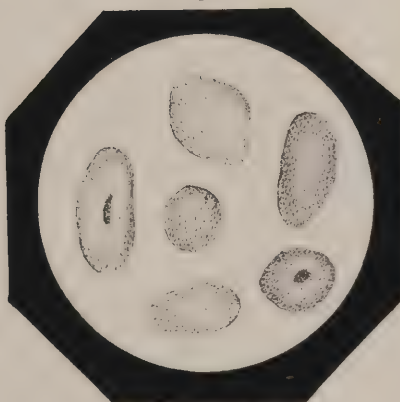

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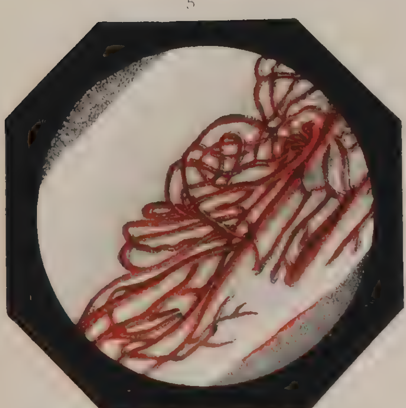

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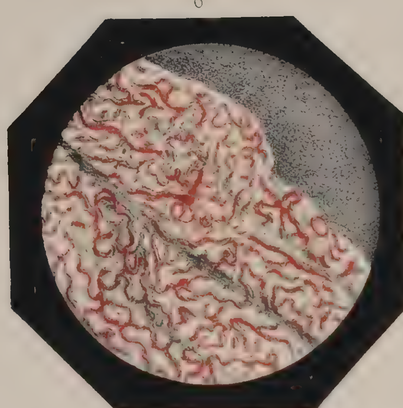


E C Kellogg lith

PLATE LXXI.

The vascular surface of the matrix of the nail, surrounded by the injected papillæ of the skin; the nail and epidermis having been removed.

a. Papillæ of the skin on the dorsal surface of the finger.

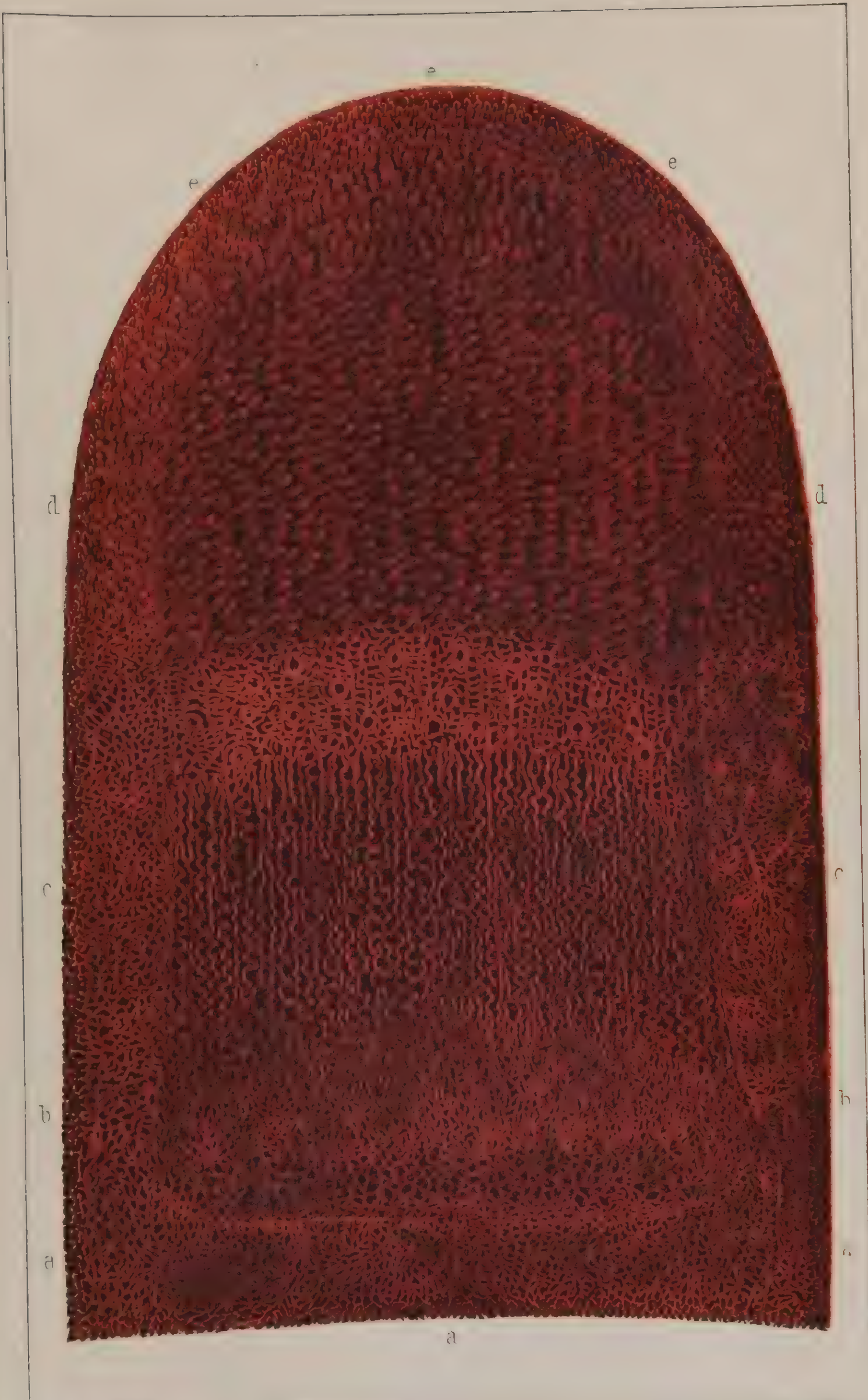
b. The lunula: here exist several rows of convoluted capillaries, more or less complex; these are the *horn-vessels* of Mr. Rainey.

c. Vessels connecting the lunula with those secreting cuticle. The office of these vessels, probably, is to secrete a substance intermediate between the horn and the cuticle, and thus cause an intimate union between them.

d. Folds, or plications of the matrix: these increase in depth as they approach the end of the finger. They consist of a fold of basement membrane, enclosing a series of loops of vessels. They are continued into the ridges of the finger, and secrete the cuticular part of the nail.

e. Papillæ of the tip of the finger. 8 diameters.

See Appendix, page 463.



E. C. Kellogg lith.

PLATE LXXII.

Fig. 1. Tendon from the arm. In this figure, the vessels are not seen to present so uniformly terminal loopings as in the vessels of cartilage. In many instances, they seem to return upon themselves. The same termination is sometimes seen of vessels in cartilage. 60 diameters.

Fig. 2. Tendon from the arm, nearer its muscular union. 30 diameters.

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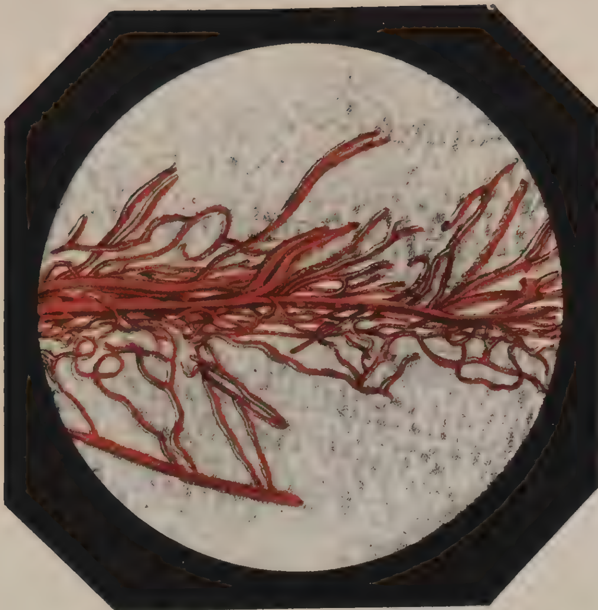

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E. C. Kellogg lith

PLATE LXXIII.

Fig. 1. Lymphatic vessels and lymphatic glands from the spermatic cord of the horse, magnified 8 diameters.

AA. The lymphatic glands.

a. a. a. Peripheral, efferent larger lymphatic vessels.

b. b. An efferent or central lymphatic vessel.

c. c. Superficial net-work of delicate lymphatics, which serves in part to connect the small flat gland, *d*, with the efferent vessel, *b*.

d. A very small, loose, semi-glandular plexus of lymphatic vessels.

e. Extensive lymphatic net-work, formed of the vessels of the gland, and the parts immediately adjacent.

f. Larger lymphatic vessels, passing over and near to the gland, the numerous valves of which are obvious.

g. Delicate efferent lymphatics. After Gerber.

Figs. 2, 3, and 4, are here introduced to exhibit the relative size of the air-cells of the lungs at different ages: all equally magnified.

Fig. 2, represents the capillaries and air-cells of a fœtal lung. In this, no air has yet entered, and the air-cells are observed to be small, and the structure dense. 60 diameters.

Fig. 3, represents capillaries and air-cells of an infant's lung. 60 diameters.

Fig. 4. Capillaries and air-cells of a lung of an adult. 60 diameters. It is probable that the microscopic examination of the lungs, in medico-legal questions, as to whether respiration had taken place, would afford more conclusive evidence than could be furnished by the usual tests.

Fig. 5. The branchial laminæ of the eel. 60 diameters.

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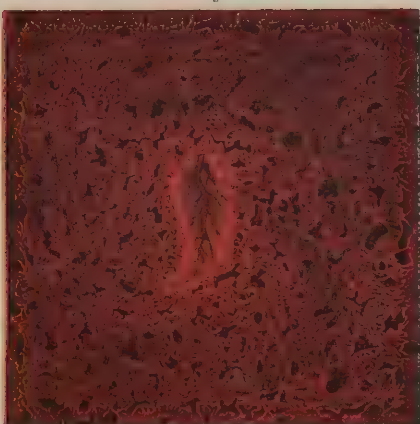

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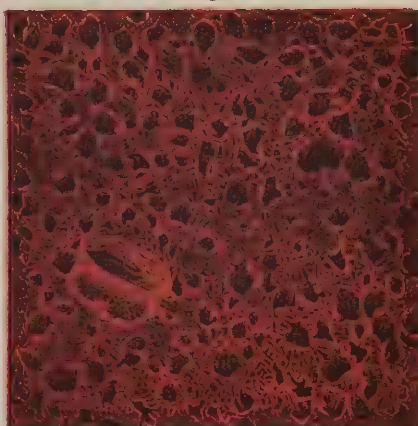

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PLATE LXXIV.

Fig. 1. Injected mucous membrane of fœtal stomach. 60 diameters. From a very perfect injection by Dr. J. Neill.

The honey-comb structure, exhibiting large and polygonal cells, formed by one or more convoluted capillaries, is here well shown. At the bottoms of these larger cells, two, three, or more small ones may be seen. This honey-comb appearance has been considered by many writers to exist throughout the entire mucous lining of the stomach. Dr. Jno. Neill has made some valuable investigations on the structure of this mucous membrane, and his views, founded on the examination of many injected stomachs, are published in the *Am. Journ. of Med. Sciences,* No. XLI. (new series) for Jan. 1851. Figs. 2, 3, and 4 are taken from that paper.

Dr. Neill considers that after the removal of the epithelium, "the surface of the mucous membrane presents different appearances in different portions of the stomach; this fact not having been sufficiently appreciated by observers, we consider as one of the sources of error in the ordinary descriptions of this organ. By far the larger portion exhibits various modifications of the honey-comb structure, the cells are large and polygonal in some parts; in others, they are smaller, deeper, and rounder; the ridges between these cells are formed of one or more convoluted capillaries, and this arrangement of capillaries is particularly evident in the rugæ (see *fig.* 2). The walls of these cells, or pockets, are formed of a net-work of capillaries, which sub-divides each cell into smaller ones; these cells are what are ordinarily called the orifices of gastric glands, and the sub-division in the bottom of each cell corresponds with the described orifices of tubuli. In the antrum pylori, the structure is modified, the ridges between the cells become larger, more elevated (see *fig.* 3), and as we approach the

pyloric orifice, *conical villi* make their appearance; these villi are larger and more numerous towards the pyloric valve, so that fewer of the angular or polygonal cells are visible in their interstices; they are not so large as the villi of the small intestine, but in other respects their external appearances are precisely similar (see *fig.* 4). When well injected, they seem to be composed of capillaries, closely united by a basement membrane, and forming a pyramidal projection.

"There may be said to be three different appearances presented by the microscopic examination of the injected capillaries of the mucous membrane of the stomach, when deprived of its epithelium. First, The convexity of a large ruga will have a comparatively smooth and even appearance, formed by convoluted and inter-twining capillaries. Second, Any other portion excepting the antrum will exhibit cells or alveoli of different sizes and shapes, separated by ridges of various thicknesses, and these ridges are composed of capillaries arranged in the same manner as in the rugæ. Third, in the antrum pylori, there are *conical villi*, and cells exist in the interstices and at their bases."

It will be seen that this description, which the writer has verified from examination of Dr. Neill's preparations, differs considerably from those usually given in the various text-books and works treating of minute anatomy. Dr. Neill is disposed to think that the gastric villi may be in some way associated with absorption. What precise part they play in this function, remains yet to be determined.

Fig. 2. Ridges and cells from the left extremity of the fœtal stomach. After Dr. J. Neill. About 65 diameters.

Fig. 3. Deeper cells and more elevated ridges from the antrum pylori. After Dr. Neill. About 65 diameters.

Fig. 4. Gastric villi, from the pyloris. After Dr. J. Neill. About 65 diameters.

Fig. 5. The villi of the duodenum injected and the epithelium removed. The villi in this portion of the small intestine are broad, flat, regular and shorter than in the other two divisions. From an injection by Dr. Neill. 60 diameters.

Fig. 6. Villi from the jejunum: here the villi are longer, not so broad, and less regularly disposed. 60 diameters.

Plate LXXII

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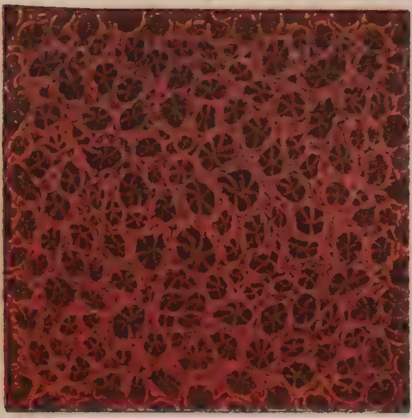

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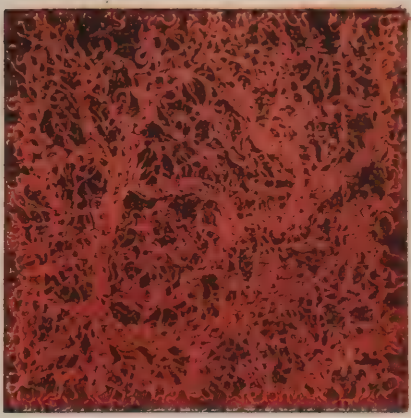

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PLATE LXXV.

Fig. 1. Villi from the ileum. From an injection by Dr. J. Neill. In this portion of the small intestine, the villi are more conical than in either of the other divisions, not so flat as in the duodenum, nor so long as in the jejunum. These different appearances become more or less modified as we pass from one division of the intestinal canal to the others. 60 diameters.

Fig. 2. Shows the arrangement of the vessels in the muscular coat

Fig. 3. Mucous membrane of the appendix vermiformis cœci, showing the capillaries and mucous crypts. Dr. J. Neill, in the *Philadelphia Medical Examiner*, for February, 1851, has accurately described the difference of structure between this appendix and the colon. In the first, the crypts are variable in size and shape, and the distances between them by no means uniform. In the colon, the mucous membrane is regularly studded with mucous crypts or follicles of Lieberkühn, all nearly of the same size and shape, and almost equi-distant. After Neill. About 60 diameters.

Fig. 4. Mucous follicles and capillaries of the colon. After Neill. About 60 diameters.

Fig. 5. The vascular plexus of the Malpighian body in a healthy state. The relations of the uriniferous tubes to the Malpighian bodies are also shown. After Toynbee. About 100 diameters.

Fig. 6. The vascular plexus of the Malpighian body enlarged, as occurs in the first stage of Bright's disease: the tubuli are also seen enlarged. After Toynbee. About 100 diameters.

LXXV

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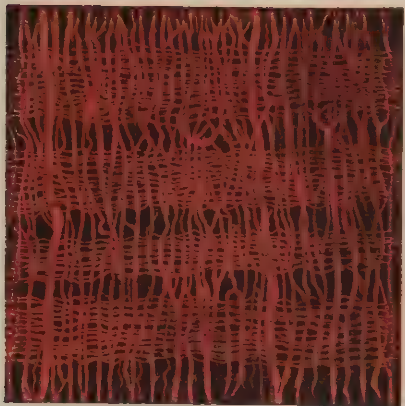

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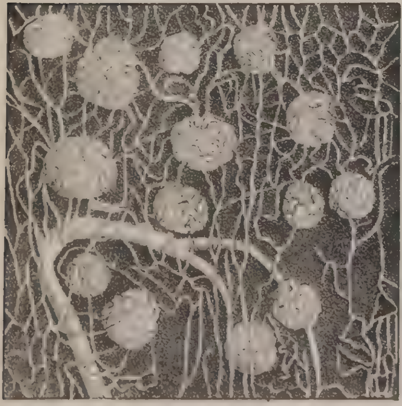

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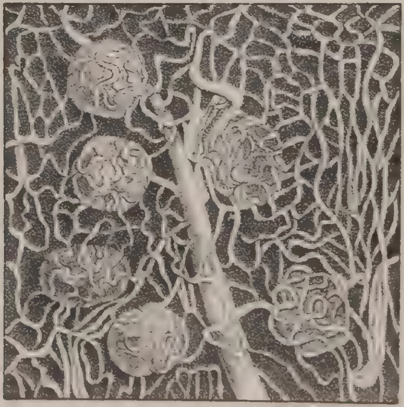

PLATE LXXVI.

Fig. 1. The enlarged veins of the kidney occurring in the first stage of Bright's disease. After Toynbee.

Fig. 2. Another view of the veins in the same stage: here may be noticed the commencement of the stellated condition so characteristic of the more advanced stages of the disease. After Toynbee.

Fig. 3. The stellated appearance of the veins in the advanced stage of the disease. After Toynbee.

Fig. 4. Granulation on the surface of the kidney in an advanced stage of Bright's disease. After Toynbee.

Fig. 5. A urinary tube, very much dilated, in the third stage of the disease. After Toynbee.

All the above figures are magnified about 100 diameters.

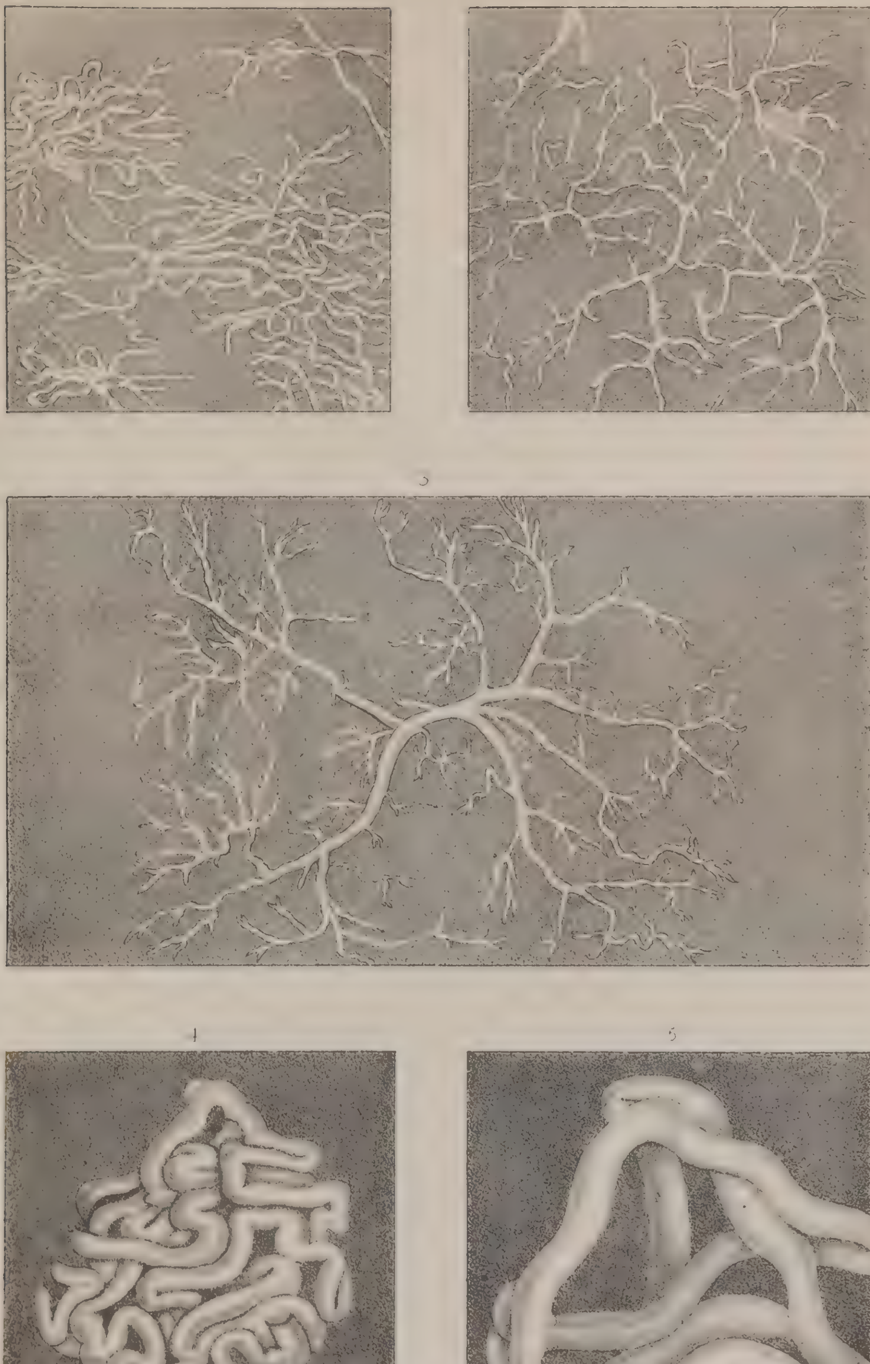
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PLATE LXXVII.

Fig. 1, represents a magnified view of a vertical section of the skin under a power of seventy or eighty diameters: *g. g.* Sudoriparous glands imbedded in fat vesicles; *d.* the ducts of the same passing in a flexuous course through the areolar tissue to *de*, the dermic portion of the skin; two of these ducts are represented cut across. On the right, a duct is represented cut open at its upper part, and its parietes are seen to be continuous with the basement membrane of the papillæ which bound it on each side, assuming as it approaches them an infundibular form. Between the same two papillæ may be seen the lowest portion of the *epidermic* part of a duct, at first very indistinctly, and without any defined continuity of structure with the duct below—gradually assuming a spiral form, and having the scales of which its walls are composed, arranged parallel with the axis of the passage. The other ducts are seen dipping down between and behind the papillæ; at *n*, may be seen the nuclei on the basement membrane of the papillæ, which at *nc* are developed into a layer of nucleated cells, forming the lower stratum of the epidermis, *ep*, through which one complete sudoriferous passage, *p*, may be seen passing to the surface, together with portions of others. The spaces between these passages have been cut away in the preparation, by which the direction of the scales of the epidermis not in the vicinity of a passage are seen to be horizontal, but variously inclined where situated in its vicinity. After Rainey and Ralph.

Fig. 2, is a magnified view (220 diameters) of the dermic part: *d*, the *dermic* portion of a duct cut open at its upper part, also

with the basement membrane of the papillæ on each side continuous with it; *p*, the *epidermic* portion of the duct between the papillæ, exhibiting a scaly structure almost at its commencement; *n*, nuclei on the basement membrane, at *nc*, developed into nucleated cells, and forming together the lower part of the epidermis; above which, at *ep*, may be seen the commencement of the scaly layer of the epidermis; *p*, three papillæ with a vascular loop in each. After Rainey and Ralph.

Fig. 3. Mucous membrane of the gall-bladder; from an injection by Dr. Jno. Neill, of Philadelphia (see page 358). 50 diameters.

Fig. 4. Transverse section of the muscles of the tongue. The fibres are of the striped variety, but are not here sufficiently magnified to show the lines. 45 diameters.

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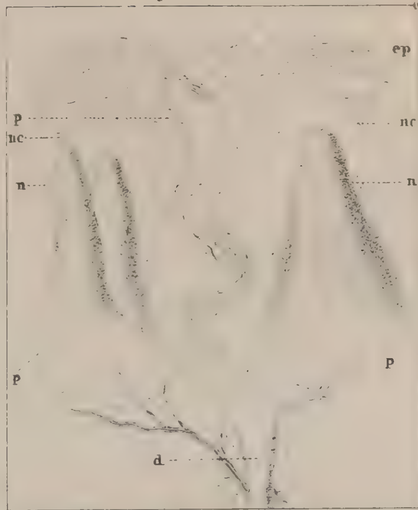

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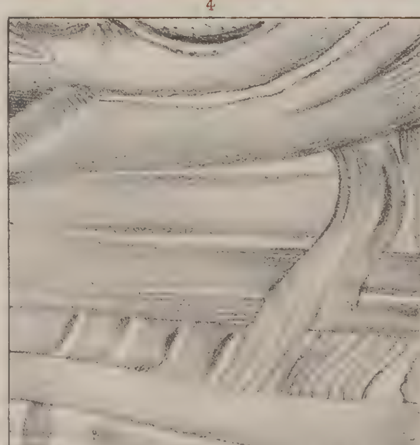

F C Kellogg lith

PLATE LXXVIII.

Fig. 1. The terminal loopings of vessels in the cornea of the eye of a pig. 45 diameters.

Fig. 2. The conjunctival epithelium of the cornea in the eye of the viper, showing its vascularity. In animals that cast their skin, this lamina is shed with the cuticle of the body. In the human eye, this lamina is not vascular. 45 diameters.

Fig. 3. Vessels of the choroid coat of the fœtal eye, near the ciliary processes. 45 diameters.

Fig. 4. Ciliary processes of the human adult eye, showing their form of origin. From an injection by Dr. Jno. Neill, of Philadelphia. 45 diameters.

Fig. 5. Mucous lining of the unimpregnated uterus of the sow. 35 diameters.

Fig. 6. Mucous lining of the impregnated uterus of the same animal, showing how the rugæ become developed during gestation. 35 diameters.

Plate LXXVIII

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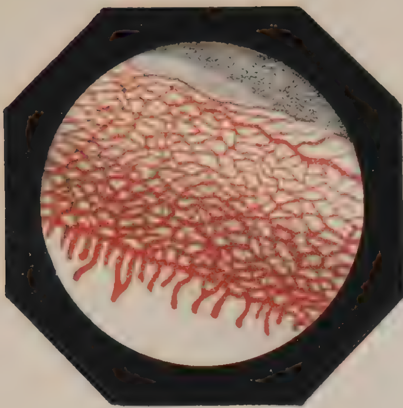

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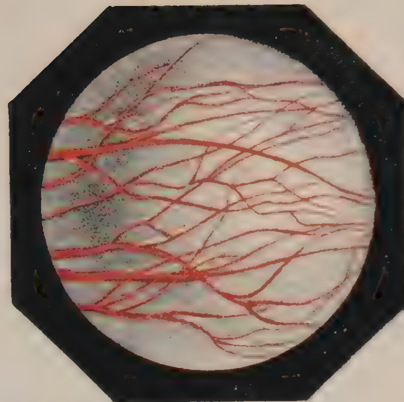

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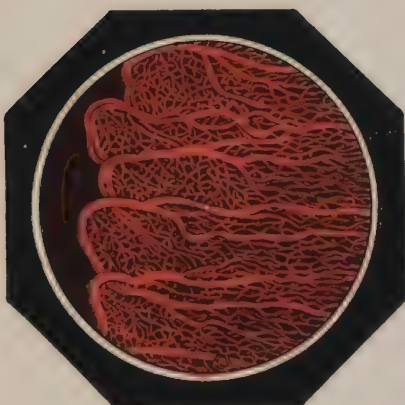

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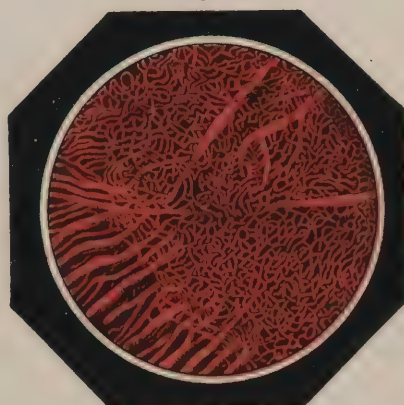

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W. R. B. del

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PLATE LXXIX.

Fig. 1. A tuft from the fœtal portion of the human placenta. 45 diameters.

Fig. 2. Papillæ of the gum: a portion of the tooth is represented to exhibit the manner in which the papillæ surround it. From an injection by Dr. Neill. 45 diameters.

Fig. 3. Papillæ from the lip: these are observed to be rather longer and more prominent than in the gum. From an injection by Dr. Neill. 45 diameters.

Fig. 4. The arrangement of blood-vessels in the mucous membrane of the trachea. 45 diameters.

Fig. 5, shows the vascularity of the buccal membrane. 60 diameters.

Fig. 6, shows the vascularity of the mucous membrane of the bladder. 60 diameters.

Plate LXXIX.

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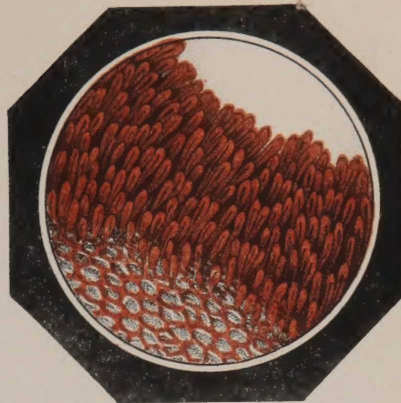

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E. C. Kellogg, lith.